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THE IMPERIAL COLLEGE OF TROPICAL AGRICULTURE, TRINIDAD, B.W.I.

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TROPICAL AGRICULTURE is published at the Imperial College of Tropical Agriculture, St. Augustine, Trinidad, West Indies, at the end of the third week of the month preceding the one of issue. Advertisement rates can be obtained at the College from the Editor, or from the Secretary of the College, 14, Trinity Square, London, E. C. 3, England. The Editor will be glad to consider authoritative articles for publication. It is understood that opinions expressed in signed articles are those of the author and do not necessarily represent the policy or opinion of the College Authorities. Increasing numbers of inquiries are being received from various parts of the tropics which can be answered only by persons possessed of an intimate knowledge of local conditions. Enquirers should first satisfy themselves that their local Department of Agriculture is not able to supply them with the desired information before communicating with us. Correspondence which will be replied to is invited on all other matters pertaining to tropical agriculture, science and development.

AGRICULTURAL RESEARCH.

IN a recent number of the *Scientific Monthly*, Sidney B. Haskell, Director, Massachusetts Agricultural Experiment Station discusses the Service of State supported Agricultural Research, and develops his argument by reference to the work done on the Mosaic disease of potatoes for the improvemnt of the conditions brought about by the deterioration of seed potatoes.

State supported Agricultural Experiment Stations in the United States were first established fifty years ago and these have now come to be the main agencies of the several states for the conduct of research with reference to agriculture. From small appropriations in the early beginnings the money provided for these institutions has increased gradually to the large total of over ten million dollars annually, of which six millions are provided by the several states and the remainder by the Federal Government. Problems of plant and animal diseases, of the maintenance of soil fertility, of the breeding of plants and animals have formed the major part of the programs of these stations, the studies on farm management, on distribution and marketing of farm products, on the purchase of farm commodities and on the manufacture of agricultural products have been among the more recent developments.

In attempting to present a basis for an estimate of the value of the research work of these stations the investigations recently carried out at the Maine State Experiment Station have been taken as the principal example. Reference is also made to results in the State of Iowa in connection with the cultivation of oats. The following quotation from a report of the Iowa Station some thirty-five years ago indicates the conditions which existed there at that time :—

"From the frequent partial failures of our oat crops on account of rust and the rapid deterioration of the best oat varieties which we have imported from the best oat countries, we can draw no other conclusion than that Iowa is not a good oat state."

A recent publicity statement coming from the same State indicates a great change in the situation in Iowa as to oat cultivation.

"It is estimated that over 11,000,000 more bushels of oats were grown on Iowa's 5,774,000 oat acreage in 1924 as the result of careful selection of varieties and their adaptability to soil and climatic conditions in the various sections of the state. A recent survey disclosed that about 46 per cent.

of our oat acreage in 1924 was made up of four varieties: Iowa 103, which seems better adapted to southern Iowa; Iowa, which develops more favourably under the conditions in the northern countries; Iowa 105, which has a short stiff straw and is recommended only for very rich soils; and Iogren, a medium late maturing variety, which has been outyielding home grown varieties and which is expected to meet with considerable popularity."

The investigation and research work required to bring about a change such as that indicated has been enormous in quantity, and most persistent and highly scientific in quality. First there was the canvass of the world to find the best varieties, and the field testing of these for the weeding out of the poorer sorts, and then the breeding of strains with peculiar qualities and adaptation suitable to the soil and climate of the new environment, in the attempt to produce the oat best suited to Iowa conditions. In addition to this work and supplementary to it there was the research into the control of disease and the maintenance of soil fertility. In the case of the research at the Maine Experiment Station similar beneficial results were obtained but the methods and objects of the investigations were somewhat different. For about forty years it has been recognised in the United States that "seed" potatoes deteriorate, that is to say varieties which give good results when first introduced into a locality, if grown year after year from "seed" produced in that locality have a tendency to "run out," and give poorer results each year. This deterioration was more marked the further south one went and a practice has grown up of importing "seed" each year from the north, and Maine had become the source of "seed" potatoes for a very large potato growing area.

In the spring of 1918 the Maine Station in co-operation with the Bureau of Plant Industry of the United States Department of Agriculture undertook a co-operation research on the transmission of the so called Mosaic disease of the potato. The disease had been recognised in the State in 1912, had shown itself destructive, had come from no one knew where and had been present no one knew how long. A general survey in 1913 established the fact that it was distributed throughout the country. Research established the fact that the disease was transmitted from diseased to healthy plants by the green aphis of the potato, and from season to season through the tubers used for planting. This research project had attained its object, the nature of the disease had been established, although its causal agent was not known, its distribution determined, and the means of transmission to healthy plants discovered.

In the attempt to answer the question whether this particular research is worth what it cost it is stated that while anything like a definite estimate of the cost of such an investigation is impossible, it may be taken that the Maine Station spent, say, thirty thousand dollars and the United States Department of Agriculture an equal amount. In estimating the value of the findings it is pointed out that the knowledge obtained in the course of time will benefit the three million to four million farmers in the country who grow potatoes. The potato is a staple food product and between three million and four million acres of this vegetable crop are grown in the United States each year. Each acre represents an investment of human energy of at least five full working days, and in many instances this is much greater.

The deterioration of potatoes was originally established by co-operation tests between the Experimental Stations of Vermont and Maryland. Starting with seed from the same source they annually exchanged a part of their seed product. With the first year's crop differences were slight, and in the third crop the differences were very great. The potatoes which had been continuously grown in Maryland had greatly degenerated. Seed degeneration was thus established as a vital matter; in southern districts it was rapid and in northern localities it was less and might be non-existent. Thus was established the prejudice in favour of northern grown seed. Following this came the certification of seed. Seed potatoes were grown in special plots and not selected from the ordinary field crop. This produced conflicting results, sometimes very encouraging and at other times very discouraging.

However, when the means of infection was known, the certificate of seed origin became of much more value. By separating the seed plots from other potatoes the probability of infection became less.

The gain in yield from the use of certified seed is taken as not less than ten barrels or thirty bushels per acre. In Maine, in 1924, 41 per cent. of the total acreage of potatoes was planted with certified seed as against 16 per cent. in 1923, an increase of 34,000 acres in the planting of which certified seed was used, and at the rate of ten barrels per acre the increased crop amounted to 340,000 barrels or over one million bushels.

But the effects of that research are not confined to the State or even the country in which the work was carried out. Every farmer in the United States and Canada, at least, where potatoes are grown either benefits or may benefit from the knowledge that is thus available, and the successful outcome of the research and the practical application of the results to the actual farming problem gives an indication of the lines of attack on other problems and the practical application of the results.

It is impossible, however, to calculate the value of research merely on a basis of increased production. Increased production usually results in lower prices so that the producer must produce more with the same unit of land, labour, and expense of cultivation. On the other hand the consumer benefits by lower prices and the greater availability of the commodity, and when that

commodity is, like the potato, a staple food of the great mass of the people the benefit to the consumer is very great indeed.

There can be no doubt that research pays. It may be difficult to express in figures just how much it pays and to express briefly the many and diverse avenues through which the profits of successful investigation reach all those who benefit by them.

Other favourable results of agricultural research are not wanting to lend point to the value of this kind of work. It has recently been announced in the *Canadian Gazette* that the development of Garnet wheat provides the Canadian farmer with a means of escape from the attacks of rust, for by its earlier ripening this variety will escape the usual attacks of rust. Its earlier maturity by eight or ten days, is expected to prove of great value in enabling it to develop and ripen its grain before the attack of the rust can affect it. Also, earlier ripening means earlier harvesting, and earlier threshing, and thus a better chance is given for finishing the season's work before the advent of frost, hail and snow. This earliness of ripening also means another thing. The few days advance in the maturity of the grain will allow wheat cultivation to be extended further north, and it is given as the opinion of the Minister of Agriculture for Canada that the Northern limit of Agriculture in Western Canada has been forced back from 60 to 75 miles.

The institutions for agricultural research in the tropics are of more recent establishment than in the northern countries, but instances are not wanting of the beneficial results of the application of research to the problems of tropical agriculture. Some thirty years ago when the sugar industry of the United States was threatened by the attacks of fungoid disease in the Bourbon cane, the production of seedling canes to replace the varieties formerly grown saved the situation. Barbados became famous as a source of seedling canes which have been of the greatest value to the sugar producing countries of the world. It is possible, however, that this problem is not completely solved for the new varieties have a tendency to run out after being cultivated for a time and the production of new varieties has been a constant necessity. The successful Barbados varieties of to-day in any locality are not the same as those of yesterday and it is probable that the varieties of to-morrow will not be the same as those of to-day. New seedling varieties are being produced in other sugar-cane growing localities and in all of them there is the continued attempt to produce new varieties good enough to be taken into field cultivation.

The disease which caused the deterioration of the potato varieties is a Mosaic, a virus disease, transmitted through the tubers used for planting. The Mosaic disease which attacks sugar-cane is well known in its usual manifestation on leaves and stalk. May there not be a possibility of this or a similar disease which while not manifesting itself outwardly is transmitted through the planting material causing these varieties to run out after a series of years of cultivation? If this should be discovered to be the case, the need of constant production of new varieties would be lessened and the gain in yield of cane and sugar per acre which is indicated with the introduction of each new variety taken into cultivation might be maintained.

Another problem in tropical agriculture which seems likely to be settled by research methods relates to the production of cotton in South Africa. There, throughout the low veld, the attacks of a small insect called the cotton jassid causes serious losses in the cotton crop, the attacked plants losing leaves and bolls and in the case of serious attack dying completely. The problem is one of early ripening on the part of the plant and the prevention of the insect attack. If the plant matures its first bolls early they may escape the jassid attack and a good first crop be secured. If the first crop bolls are seriously attacked by bollworms. and the jassid attack follows, no crop is likely to be produced. It has been found that certain strains or races of the cotton plant are resistent to the jassid, that is to say that they are not attacked by the jassid even when growing alongside other plants which are attacked. The resistent varieties have thus a very desirable character and it is proposed to improve their other characters, and produce a cotton possessing the desired field characters, qualities of lint and ginning properties. If this work is successful it will be possible to grow successfully cotton of good quality over great areas, where now the prevalence of a small insect makes cotton growing impracticable if not impossible.

The examples of application of research to tropical agriculture might be multiplied. They have referred to crop plants and the pests and diseases that affect them, and to man and his domestic animals and the pests and diseases that affect them. Scientific investigations and research have made it possible to grow crop plants in localities where the natural and environmental conditions seem to be all against it. They have also made it possible for man to live and work in health and happiness in districts which were entirely inimical under the conditions formerly existing.

At the present time with the need for increased supplies of raw products from the tropics, who can doubt that research into all the conditions which affect the lives and welfare of the planter and labourer, the improvement in method and the adaptability to unfavourable environment is profitable and worth while, and deserving of substantial and continuous support?

ROYAL SOCIETY OF ARTS.

THE College has had a valuable gift of six volumes and several odd numbers of the Journal of the Royal Society of Arts, which have been presented by the Society to add to the files of this Journal in the College Library. The series will now be complete in the Library from Vol. 34, 1885, to date.

COFFEE AND COTTON IN BRAZIL.

(*Concluded.*)

THE coffee tree in Sao Paulo thrives best when planted in virgin soil. A new-land coffee grove, when five or six years old, will often yield at the rate of 2,000 pounds an acre, but the yield falls off as the tree become older and the original fertility of the soil becomes depleted. The majority of the coffee trees of Sao Paulo are no longer young, and the average production is much below the maximum. Detailed statistics of production for 1922-23 have just been issued, from which it appears that in that year 899,239,100 coffee trees in the 156 coffee-producing municipios of Sao Paulo yielded 7,046,900 bags of 60 kilos, which figures about one pound per tree; this amounts to 340 pounds per acre. It is important to note that one pound per tree is an *average* figure; while some plantations yield more, many yield less, and some decidedly less. Fifty million trees in Sao Paulo, or 5½ per cent. of the total, yielded less than 220 pounds an acre, and in some important municipios the average production fell to and even below 170 pounds per acre.

While the production of coffee per acre varies thus enormously from above 2,000 to below 170 pounds, the costs of keeping up a plantation do not vary in anything like the same proportion. With the exception of a few extra hands at harvest time to handle an extra volume, it costs about the same for overhead, taxes, interest, caring for the trees, keeping down weeds, plucking, etc. In general, a fazendeiro must colonize on his fazenda an average of one person (including men, women and children) for each 1,000 trees, or 1 to every 3 acres. A family of six, in which there are several children old enough to work, can thus take charge of at most 20 acres of coffee trees. The product of these 20 acres must be worth enough to pay the family's wages, freights, commissions, extras, and meet overhead and taxes.

When the trees are young and coffee prices high, the fazendeiro can manage this very neatly; but when the trees have passed the first flush of youth and prices are low, he is confronted by a desperate need for cheap labour.

The following table shows the gross returns from an average family's labour in a given crop year, with varying coffee prices and different yields per acre:

Yield per acre	*Returns from 20 acres, at given Coffee Prices.*			
Pounds.	*20c.*	*14c.*	*12c.*	*10c.*
2,000	$8,000	$5,600	$4,800	$4,000
1,500	6,000	4,200	3,600	3,000
1,000	4,000	2,800	2,400	2,000
800	3,200	2,240	1,920	1,600
600	2,400	1,680	1,440	1,200
400	1,600	1,120	960	800
350	1,400	980	840	700
300	1,200	840	720	600
250	1,000	700	600	500

(The table as published herewith has been reduced by the omission of the figures, which appear in the original, showing values of yields at prices 18 cents, 16 cents and 8 cents per lb.)

For example, with coffee at 14 cents and an acreage yield of 350 pounds, the fazendeiro has $980 with which to pay the annual wages of a family of six and meet all other expenses chargeable to 20 acres of coffee trees; he takes his profit from what is left. If coffee prices are 12 cents and the yield 300 pounds, he has $720 with which to meet practically the same expenses. Where the yield is only 250 pounds, which is not seldom, and the price 10 cents, which in the past has been by no means unknown, the results are painful to contemplate from the standpoint of the fazendeiro's ability to pay a decent wage.

Cotton prices have for some years ruled high. In the New York Market they have lately been around 24 cents; and there is every reason to believe that they will continue high for some time to come. We have seen that when the new ground is planted to coffee the yield after the fifth year will run up to 2,000 pounds an acre in some cases; the same new ground planted in cotton will yield a maximum of 3,200 pounds of unginned cotton the first year. This high yield is no more sustained by cotton than by coffee, but the rate of cotton production can be better kept up by the use of fertiliser than is possible with coffee. We here give a table similar to the one given before for coffee, to show the returns from a 20-acre cotton patch at different yields and different prices for lint cotton. Cotton seed is figured in at the uniform price of $20 a ton:

Yield per acre Unginned,	*Returns from 20 acres at given Cotton Prices.*			
Pounds.	*24c.*	*20c.*	*16c.*	*12c.*
3,200	$4,320	$3,680	$3,040	$2,400
2,000	2,700	2,300	1,900	1,500
1,200	1,620	1,380	1,140	900
1,000	1,350	1,150	950	750
800	1,080	920	760	600
690	928	782	646	510

A fair yield of cotton is 1,000 pounds of unginned product, equal to 250 pounds of lint; a fair average yield of coffee is 350 pounds per acre. At these yields cotton at 24 cents is distinctly better than coffee at 18. It is very evident that, even with coffee at 20 cents, the owner of a plantation yielding below 300 pounds an acre will not realise the same gross return, to say nothing of net, that might be obtained from the same area in cotton, which can be cultivated and marketed at less expense.

These conditions put a severe strain on the labour market, as far as older plantations are concerned. A fazendeiro whose trees are yielding one pound of coffee cannot consider the same wage budget that is well within the ability of the one whose trees are yielding two or three pounds each. The more efficient among his labourers desert him for the richer plantations, or set up

for themselves as small independent farmers, turning their attention to crops that require a smaller capital investment than coffee.

To hold labour on the plantations of small producing capacity the fazendeiro must make concessions that would not be thought of a few years ago. The "Colonos" will sign up with him only if he gives them land which they can cultivate on their own hook, with crops of their own choosing, and the fazendeiro is compelled to abandon the least productive of his coffee groves in order to have labour at hand to take care of the remainder at higher unit costs, by labourers who have other employment besides looking after the master's coffee trees.

The upshot of this whole situation is that circumstances have jockeyed a considerable part of the Sao Paulo coffee industry into a position where it has become peculiarly sensitive to alterations in coffee prices. As long as coffee brings about 20 cents a pound, things will go along nicely enough; but let the price fall to 12 or 14 cents and, even where the Stephanderes troubleth not, there will be a more or less pronounced drift away from coffee production will tend to be restricted more and more to younger trees and newer ground.

Any considerable fall in cotton prices being apparently out of the question for a long time to come, the situation will be directly dependent on coffee prices. With every decrease in the price of coffee there will be an increase in the area now under coffee that will become relatively unprofitable, if not absolutely so. In so far as this putting of the older plantations out of action is not counterbalanced by the taking of new ones, production will be diminished and prices will rebound. Thus does the price of cotton act as a brake on the fall of coffee prices.

O. W. WILLCOX
in Tea and Coffee Trade Journal.

THE AMANI INSTITUTE.

A NOTE in *Nature*, 30th January, 1926, refers to the revival of interest in the re-establishment of the Amani Institute in Tanganyika and suggests that presumably the Secretary of State for the Colonies will shortly see to the appointment of a Director for that research institution.

It has been announced in the Kenya Legislative Council that following on the recommendation of the East African Parliamentary Commission steps were being taken for the re-establishment of this Institute and the East African territories were being asked to contribute towards its maintenance up to a total of £8,000 yearly and in addition an initial capital expenditure of £6,000 was to be incurred. It was hoped that the contribution from the Imperial Government would take the form of a loan from the £10,000,000 development loan.

CHEMICAL NOTES.

Compiled by the College Department of Chemistry and Physics.

A New Synthetic Organic Glass.

Considerable interest has been recently aroused by an article which appeared in the journal, *The Motor* (19th January, 1926), describing a new synthetic substance, derived from urea and formaldehyde, which possesses many of the valuable specific properties of glass. It is unlike glass, however, in that it is flexible, resilient and non-fragile, has low specific gravity (1.44), and transmits ultraviolet light readily. This last property is especially important, since it is becoming recognized that exposure of the animal and plant body to ultraviolet rays is extremely beneficial to health. Ordinary glass cuts off these particular rays, so that windowed houses and plant conservatories, in the construction of which glass is usually employed, unfortunately eliminate one of the most valuable components of sunlight.

The new synthetic substance takes up dye-stuffs quite easily, retains its normal colorlessness on exposure, resists weathering, is not easily scratched (hardness 2.95 on Moh's scale), does not splinter when broken, and is an excellent electrical insulator.

Although the new material has hardly left the laboratory stage, it is reported that a factory for its commercial production has been set up in Vienna by Messrs. Pollak and Ripper, the inventors, and that another factory is already in operation in England. The costs of manufacture, however, have not yet been divulged.

Among the possible articles that may be fashioned out of synthetic organic glass may be mentioned windows, motor-car windscreens, transparent petrol tanks, tumblers, and fountain pens, insulators, and optical lenses.

Maize Starch Manufacture.

Botanical varieties of Maize differ greatly in starch-producing faculty. The best starch-forming strain is that known as Hickory King. The cleaned maize is steeped in dilute sulphurous acid solution at 50° to 60°C for two to three days. This softens and bleaches the starch-containing tissues, and, at the same time, prevents fermentation. The starch is then separated from the "germ" and from husk by treatment in a mill and in a shaker constructed of copper gauze of 144 mesh. It is then ground to the requisite fineness in a stone mill, and again sifted through a silk screen shaker. The starch is further separated by settling and finally dried.—(*Journ. Chem. Met. and Min. Soc., South Africa*, September, 1924.)

CROP PRODUCTS MANUFACTURE.

Summary of Recent Progress in the Manufacture of Certain Tropical Crop Products in Britain.

THE following summary is derived mainly from three articles that appeared in the January number of "The Industrial Chemist," 1926. The first is by Mr. Rex Furness, M.SC., on Fats; the second, by Mr. S. A. Brazier, M.SC., on Rubber; and the third, by the Director of the British Drug Houses, Ltd., Mr. F. H. Carr, C.B.E., on Fine Chemicals.

1.—*The Oils and Fats Industries.*

No startling developments are recorded for the year 1925. Nevertheless, many promising new processes have received considerable attention, and are expected to have far-reaching results in the future.

The extraction of fat from seeds by means of solvents continues to be mainly carried out by imported petroleum spirit, technologists not yet having been wholly converted to the use of the new non-inflammable solvent, trichlorethylene, which is prepared from cheap by-product chlorine of the electrolytic alkali makers.

Fuller's earth, an agent for removing colouring matters from vegetable and animal fats, is steadily being supplanted by new active bleaching earths and by new adsorbent earths. Ozone for bleaching, has not found favour, because of adverse economic considerations, and hydrogen peroxide is still too dear for the purpose. Steam treatment in high vacuum is still the chief method used for refining and deodorizing fats.

The chemistry of rancidity has at last been placed on a sound basis, and its problems are nearing complete solution.

Considerable attention has been given during the past year to the preparation of fatty acids by synthetic methods, and by hydrocarbon oxidation, but it is not as yet commercially feasible. Similarly for glycerine, both synthetic and fermentative, and for fats from carbohydrates by the use of biological agents.

The great soap industry continues to supply an increasing home demand, and to export large quantities of its products. There appears to be a growing demand for special soap preparations and washing powders. Soap powders containing active oxygen for bleaching fabrics are gaining favour, and it has been proved that they exert much less deleterious effect than sunlight or intense rubbing.

German publications continue strongly to recommend the incorporation into soaps of cyclohexanol (*See* Chemical Notes, this Journal, December, 1925, II, 12, p. 285), especially for textile washing, but, although the products are now made in Great Britain, their adoption by soap makers is not yet apparent.

In the research laboratories, studies on the composition and structure of fats, such as palm oil, coconut oil, ground-nut oil, olive oil and soya bean oil, have been completed and have brought out many new facts and fresh methods for separating fatty acids. Much valuable work on the Vitamin—A content of fats has also been prosecuted, and the action of ultraviolet light on fats has been studied with a view to increasing their vitamin activity. This work has especial significance to makers of edible vegetable fats, for these foodstuffs are naturally deficient in vitamins. So far, however, irradiation of fats has not been practised on a commercial scale.

2.—*The Rubber Industry.*

The past year has been one of continued expansion in the motor-car industry, which is now-a-days responsible for 80 per cent. of the world's consumption of raw rubber. The price of raw rubber has accordingly risen from 1*s.* 8*d.* per pound at the beginning of the year to over 4*s.* per pound at the end, and a possible return to the "boom" conditions of 1910 is indicated. In 1910, the maximum price of 12*s.* 9*d.* per pound was reached, and some 70,000 tons of raw rubber were produced. In 1925, the production of raw rubber, however, was nearly 500,000 tons.

A problem that has recently received increased attention because of the present high price of rubber, is the partial replacement of rubber by glue in the manufacture of certain kinds of goods. A product obtained by spraying mixtures of rubber latex and glue solutions, has been shown to possess valuable properties, such as resistance to swelling by solvents.

In the plantation rubber industry, trials of formic acid, as a coagulant possessing greater efficiency and lower cost than acetic acid, have proceeded, and have yielded very encouraging results. Considerable attention has also been given to the use of sodium silico-fluoride and para-nitro-phenol as antiseptics for preserving smoked sheet from mould. These preservatives are best added to rubber latex before coagulation.

Fundamental research into the mechanism of coagulation and the structure of rubber has revealed some very interesting facts. The work of W. N. C. Belgrave in Malaya on the coagulation of latex has already been described in this Journal (Sept., 1925, II, 9, p. 208), as has also the discovery by A. E. Hauser of the double-layer structure of rubber globules in latex. As a result of this and similar work, the properties and behaviour of latex and of raw rubber are now-a-days much more thoroughly understood than formerly.

The direct use of rubber latex, particularly when concentrated by evaporation in the presence of protective colloids, or "creamed" by centrifuging, still continues to receive attention. The creaming of latex reduces transport costs, and the direct spraying of latex eliminates the use of costly solvents in spreading operations. S. E. Sheppard and N. W. Eberlin have recently succeeded in coating various metals with thick

layers of rubber by electrical precipitation from an emulsion of rubber and certain compounding ingredients. The further addition of sulphur and an organic accelerator, enables the coating subsequently to be vulcanized in place.

Changes in rubber compounding practice have followed on the examination of new or improved compounding materials. Carbon black is still the most-used material, because of its moderate price and its low specific gravity. Nearly one-half of the world's output of carbon black is now-a-days used in rubber compounding. Finely-divided china clay and magnesium carbonate, prepared in special ways, are gaining favour, but a falling off in the employment of zinc oxide and litharge, because of their high specific gravity, and corresponding high cost per unit volume, is recorded.

The use of organic accelerators of vulcanization continues to increase rapidly, giving considerable impetus to certain chemical industries. More than 2,000 tons of these substances are now used annually in rubber manufacture. Their chemical composition is very complex, and a large number of different types have been evolved. They fall into several distinct classes, for example, those that impart high tensile strength to the vulcanized rubber, and those that yield hard, stiff vulcanizates. Thiocarbanilide belongs to the first class, and diphenylguanidine to the second. Other accelerator compounds, such as aldehydes and aniline, exert a softening action during mixing. The examination of large numbers of new accelerator compounds, with the object of producing special new kinds of vulcanized rubber, has naturally necessitated a great amount of laboratory work.

Complaints have frequently been made in recent years of excessive hardness in some plantation rubbers. Increased expenditure of energy is consequently entailed when such material is worked up to a proper consistency in the rubber factory. To economise energy, softeners, such as mineral and vegetable oils, fatty acids, and Stockholm tar, are now commonly incorporated in rubber mixtures. Their effect is best gauged by the application of plasticity tests, and much attention has therefore been given during the past year to methods of measuring plasticity of rubber mixtures, and the application of these methods to factory control. Several forms of plastometer have been evolved, and find increasing use in practice. Thus precise experimental routine is gradually replacing empirical procedure in rubber manufacture.

3.—*Synthetic Drug Manufacture.*

In spite of the efforts of tropical planters to grow cheaper crops for use in the preparation of vegetable dyes and drugs, the chemist is still attempting to synthesize these substances in the laboratory at still lower cost. The latest synthetic successes include thymol, menthol and certain alkaloids. Thymol is a useful disinfectant that has heretofore been chiefly prepared from Ajowan seeds grown in India. Messrs. Howards and Sons, Ltd., of London, have now achieved its commercial synthetic manufacture from cheap raw materials. Thymol serves as an intermediate, from which menthol has been prepared by a further synthetic process. A new class of surface anaesthetics, namely, the borocaines, have recently been synthesized at Cambridge University, England, by Messrs. Copeland and Notton, working under the guidance of Sir William Pope and Professor W. E. Dixon. Borocaines are now manufactured on a commercial scale by the British Drug Houses Company. They produce similar results as cocaine, but are much more powerful, and are free from habit-forming effects. Moreover, they are much less toxic than cocaine. Further rapid strides in the Fine Chemical Industry in Britain will doubtless soon follow because of the operation of the Safeguarding of Industries Act (1921), which gives tariff protection, and because of the changed attitude of Customs authorities toward the use of denatured alcohol in industry. Thus, the number of dutiable chemical substances manufactured in Britain and included in the Board of Trade list, has increased from 1,497 in 1922 to 2,264 in 1924.

F. HARDY.

CEYLON TEA RESEARCH INSTITUTE.

THE first meeting of the governing board of the Ceylon Tea Research Institute has been held at Kandy, using the Victoria Commemoration Buildings, its headquarters. Mr. Petch was appointed director of the institute and J. W. Oldfield chairman. The board is now in communication with scientific officers through the Ceylon Association in London, and expects to make its final selections in the next month or so. Actual research work has not yet been started.

The members of the board are as follows:

Ex-Officio. Director of Agriculture; Colonial Treasurer, or, if he is unable to be present at any meeting of the board, the Assistant Colonial Treasurer; chairman, Planters' Association of Ceylon; chairman Ceylon Estates Proprietary Association.

Nominated Members. D. S. Cameron, M. L. Wilkins and R. G. Coombe, representing the Planters' Association of Ceylon; H. F. Parfitt, P. A. Keiller and J. D. Finch Noyes, representing the Ceylon Estates Proprietary Association; Col. T. G. Jayawardene, representing the Low-country Products Association of Ceylon; T. B. Panabokke, representing the small holders.—*The Tea and Coffee Trade Journal.*

The machinery firm Buckau, Ltd., of Magdeburg, Germany, has been awarded the contract for the construction and equipment of the first beet sugar factory to be erected in European Turkey, which is to be built during the coming season.—*Facts About Sugar.*

FROGHOPPER BLIGHT.

BY C. L. WITHYCOMBE.

FROGHOPPER blight of sugar-cane is confined to Central and South America, where it occurs as a specific problem; the principles underlying the trouble, however, are undoubtedly of world-wide interest and application. In Trinidad this is certainly by far the most serious affliction of sugar-cane and a grave menace to local agriculture. Elsewhere, froghopper blight appears to have attracted less attention although reports from Brazil show that another species of froghopper (*M. liturata*) has recently been causing similar damage there and under somewhat similar circumstances to those in Trinidad.

The incidence of the disease affords us an extremely complex problem involving many branches of science, and one that it would be impossible for a single investigator to elucidate fully in a lifetime. A few of the varied technical aspects have been set forth in an introductory paper recently published by the writer (1). This is the first of a series intended to deal more adequately with details. The present short article does not attempt to summarise the above-mentioned paper but merely brings out certain points therein dealt with and briefly indicates other lines of progress.

The sugar-cane froghopper of Trinidad (*Monecphora saccharina*) is a small brown Cercopid bug which is a natural denizen of grass fields wherever conditions are suitable to its breeding. Important factors governing suitability of habitat are food supply and humidity. Grass of some kind must be present as all stages feed upon this. Where there is no grass there can be no froghoppers (*M. saccharina*). Moisture is a second essential. In dry weather the breeding of the froghopper is greatly retarded and may often cease. The unfavourable period is bridged generally in the egg stage, although not always. With recommencement of rains there is a revival of activity and breeding.

The sugar-cane is a large grass and is very acceptable food to the pest. The planter clears ground and inserts a pure crop of cane so that the insect thus has abundant food. Moreover, he commonly provides this food continuously by ratooning and replanting the canes with no alternation of any other crop. It merely requires adequate rainfall to give ideal conditions for the insect. With the commencement of the wet season all is satisfactorily fulfilled and breeding proceeds apace. The first brood of adults may be insignificant but with few checks the second brood can appear in enormous numbers. The size of the remaining broods of the season is also determined by natural enemies and environmental conditions. Frequently the broods become successively smaller after a climax until the onset of the dry season which is more or less of a dead period.

The natural enemies of the froghopper are various, from minute egg parasites to reptiles, birds, and mammals, to say nothing of the controlling influence of fungal and bacterial diseases and the complex effects of weather conditions. Considering parasites and predators alone, one would expect that if there are few froghoppers early in the season few of these natural enemies will be present or if present they will starve. The few froghoppers, however, relatively unpersecuted, can increase rapidly and the second brood appearing in about eight weeks may assume alarming dimensions. Now the natural enemies if not already present are attracted, they in their turn increase and multiply on the fare provided and one often finds the next brood of froghoppers considerably diminished. The process of diminution continues until froghoppers at the end of the wet season are by no means numerous. Not only are they being actively reduced in numbers by their enemies but there is setting in, with the oncoming dry season, another stage, a resting or retarded stage. The egg constitutes the most complete resting stage. It is now that the natural enemies feel the changed conditions. They have multiplied in times of plenty and their numbers are legion, but there is no more food and the dry season approaches. Gradually they die out locally in the drought or, if they are able to do so, they forage elsewhere. It is possible that some may aestivate. Whenever the froghopper numbers are reduced to a minimum the same thing may happen, at whatever season. It is therefore reasonable to expect a continual fluctuation in the numbers of froghoppers, no two broods being of similar dimensions. Other influences, however, are also at work.

A remarkable point about froghopper blight is that serious damage may be caused by relatively few froghoppers and little damage may occasionally result from a considerable visitation. This obviously concerns the plant, which will therefore next be considered.

Every cane planter in Trinidad knows that certain canes or patches of canes may stand out comparatively free from blight when others, contiguous, have suffered badly. In certain fields, noteworthy for their proneness to blight, one may see seedling canes dying on all sides while Uba plants which have been supplied in dead holes stand up "singed" but green. Here we clearly have evidence of varietal resistance. On the other hand one may have a pure stand of any variety, Uba included, and find that certain patches alone are blighted. This is not to be accounted for merely by supposing that the froghoppers have bred and increased locally, although such is sometimes true. Everything points to the influence of environmental conditions, soil and atmospheric, as being responsible for increased susceptibility of the canes and the

1. Annals of Applied Biology. XIII, 1926, pp. 64--108.

same environmental conditions may undoubtedly affect the froghopper. In the Naparima district it is the black soils of higher calcium content which usually show less tendency to blight than the red soils of lower calcium content, and where one soil type meets the other there may be a sharp transition in blight intensity.

The frequent higher calcium content of relatively immune soils and the more alkaline reaction which commonly accompanies them has been commented upon by C. B. Williams (2). The reaction of the soil in particular once seemed likely to throw valuable light upon blight prevalence. A cursory survey was therefore made by the present writer to test this hypothesis with the result that a constant relation between blight intensity and soil reaction could not be found; some blighted fields were even neutral or slightly alkaline and few could be considered as injuriously acid. It is true that limed fields or those with a higher percentage of calcium show a greater freedom from blight on the whole and, moreover, such fields usually are more alkaline than those without lime, but no rule can apparently be laid down, and some constantly immune soils noted had acid soils.

Experiments were next made on the water requirements of the cane. The sugar-cane like any other green plant requires a certain minimum supply of water in order to carry on its life processes. These latter include growth and the manufacture of storage products, *e.g.*: sugar. Water is obtained from the soil and a certain amount is lost, of necessity, by the leaves each day. This loss is ascribed to transpiration. It can be checked to a certain limited extent by closure of the stomata (pores) in the leaf and also by rolling of the leaves, but there is still, and must be, a loss of water. Without water the plant starves and gradually uses up its reserves. On the other hand, if transpiration were to cease altogether it would die. In dry weather the cane feels the shortage of water. There is an actual shortage at the roots. Moreover, there is a greater drain from the leaves by a drier atmosphere. The leaves roll up and the circulation of water within the plant is retarded.

A somewhat similar effect is produced in other ways, one of which is the exact opposite of that described, namely, the presence of an excess of water. Excess water in the soil fills up the air spaces and the soil becomes waterlogged. Without aeration the plant behaves as though only able to obtain water with difficulty. In other words it manifests a state of physiological water shortage. We need not enter into details but the following are a few of the conditions to which a plant responds as though the water supply were reduced: drought, excessive wetness, compacted and badly aerated soil, excessive acidity or alkalinity, high salt content of the soil, soil toxicity, &c. The effect upon the plant in all the above circumstances is similar, it suffers from water shortage and starves.

2. Memoir No. 1, Dept. Agric. Trinidad & Tobago, 1921, 170 p.p.

An obvious question is suggested. Does the froghopper affect a starving plant more than a healthy one? The froghopper drains from the cane not only its water but also its sugar reserves. If this drain occurs at a time when the plant is feeling a shortage and when it has a slower transpiration stream one need not wonder that repair of the damage done by the insect is slow. Experiments confirm one's expectations. The damage done by a fixed number of froghoppers, of same sex and age, is found to be greater upon a starving plant than upon a healthy one. The dying streaks on the leaves appear in greater numbers and spread more rapidly when the plant is at a disadvantage. (A dead streak takes roughly from one to two weeks to assume prominence.)

It is anticipated then, that with a fixed number of froghoppers, more blight will be produced when there is a shortage of rain, an excess of rain; a deficiency of soil water, or an accumulation of excess soil water. Equally, a badly aerated, heavy, clay soil and a number of other adverse conditions can undermine the resistance of the plant.

It is possible therefore to account for certain of the apparent paradoxes which one encounters in the froghopper problem. With a knowledge of their nature we have some basis for discussing remedial measures. It is fully recognised that no common explanation can be applied to every case, and yet in spite of this, one universal recommendation still covers all. Agricultural improvement is, as ever, the only true solution, emphasis being laid on good tillage, drainage, pen manuring, and liming where necessary. Tillage, drainage, and pen manuring can produce benefit everywhere. Liming is possibly of value upon the great majority of our Trinidad soils as a means of improving soil condition, especially when combined with pen manuring. Every planter knows the value of such practices as those referred to above: there is nothing new about them. Whether or not he can afford to apply them is of course quite a different matter and it must be left to the individual to decide whether his savings in cane will balance his expenditure on soil amelioration. Finally, cane varieties suited to the locality, and healthy material should be employed for planting.

(*To be continued.*)

THE MIRRLEES WATSON CO., LTD., manufacturers of sugar-making and other machinery, whose advertisements appear regularly in *Tropical Agriculture* have secured an order, in the face of severe continental competition, for a Sextuple Effect Distilling Plant complete with the necessary boilers and pumps for Jeddah. The plant, which is the second for the port of Jeddah and the fourteenth supplied to various places on the coasts of the Red Sea, is capable of producing 150 tons, per 24 hours; of fresh water from sea water.

MYCOLOGICAL NOTES.

Red Stripe of Sugar-Cane.

A disease of sugar-cane, which it is thought, has not been observed in any other territory, has within recent years attracted notice in one district on the island of Hawaii. It is restricted so far, to the Tip canes (Yellow, Red and Striped) native varieties which have proved most suitable for cultivation at the higher altitudes. Characteristic of the disease is the presence of long narrow red stripes on the leaves of young cane; the upper joints may be affected also, the ground tissue becoming bright red and resulting in a top rot. Growth may be seriously retarded. The disease has been studied carefully by the pathological staff of the Experiment Station of the H.S.P.A. and proved to be caused by a bacterium to which, following the newer American nomenclature, the name *Phytomonas rubrilineans* has been given. It is a white or buff coloured motile polar-flagellate rod which liquifies gelatin, reduces nitrate, and is capable of growing as a facultative anaerobe without producing gas from sugars.

Leaf infections occur through wounds or by way of the stomata. Infection is rarely transmitted by the cutting. Inoculation experiments resulted in occasional slight infection on leaves of D 1135 and Yellow Caledonia which, however, are regarded as commercially resistant; H 109 and Badila could not be infected. Restricted lesions resembling those on sugar-cane were produced on leaves of sorghum and water soaked spots on leaves of sweet and field corn. The organism most closely resembles *B. panici* which causes similar red stripes on leaves of proso millet in the United States, but cross-inoculations resulted negatively. The restriction of the disease to the Tip canes in one district of Hawaii, although these varieties are grown extensively in other parts of the same island and its absence from other native kinds some of which have proved very susceptible following inoculation, suggested that the disease was a comparatively recent introduction.

Entry of sugar-cane into the Hawaiian Islands has been prohibited for some twenty years, so it was thought probable that Red Stripe might have come in on some other member of the grass family but none has been found naturally infected.

S. F. A.

REFERENCE.

Red Stripe Disease Studies, Experiment Station of the Hawaiian Sugar Planters' Association, 1925.

Transmission of two diseases caused by infective viruses.

1. *Bunchy Top Disease of Bananas.*

IN the preceding issue of the Journal the symptoms of this destructive disease were described, on the basis of the first report of the committee appointed by the Governments of Queensland and New South Wales, to investigate it. A second report has now been made public, describing an experiment carried out under carefully controlled conditions, which resulted in definite proof that the disease can be transmitted from affected to healthy banana plants by means of the aphis *Pentalonia nigronervosa*, an insect widely distributed on cultivated bananas in eastern Australia. Twenty healthy plants were grown in each of two screened compartments of a glasshouse and aphids taken from diseased plants were placed on those in one compartment; these plants all developed symptoms of Bunchy Top within one month following the transfer of the insects. The twenty plants in the other compartment remained free from the disease. This mode of transmission taken in conjunction with the symptoms of the disease indicates very trongly that Bunchy Tops is caused by an infective virus. The nature of the disease and the vector being known effective methods of control can now doubtless be worked out. According to the report Bunchy Top is known to occur in Australia, Fiji, Ceylon, the Philippines and Egypt.

2. *Rosette of Ground-nuts.*

This condition was described from what is now Tanganyika Territory some twenty years ago under the name Curl Disease. It is well known in Nigeria, under the name of Bunching and during recent years has become prominent in South Africa where it is called Rosette. A probably identical disease of the ground-nut is known in Java as Curl. As the names Bunching and Rosette imply, the affection is characterised by a great reduction in the length of the internodes; the leaves are small and abnormally light green or yellowish and may be curled at the edges. Plants showing the signs at an early stage of growth remain stunted and rosetted; if the disease appears at a later stage the ends of the branches develop into rounded masses of short shoots and dwarfed leaves. Complete failure of the crop may result from early and general infection. The date of planting in relation to the rains has a marked influence on the severity of the disease. Experiments carried out recently at Pretoria and Durban simultaneously have afforded definite proof that the disease can be transmitted from affected to healthy plants by means of an aphid—*Aphis leguminosae*. This mode of transmission and the signs of the disease indicate that the cause of Rosette is an infective virus, especially as no parasitic organism has been detected capable of inducing the disease.

S. F. A.

REFERENCES.

Queensland Agricultural Journal, November, 1925 (reprinted in *Tropical Agriculturist*, January, 1926).

Journal Department of Agriculture, South Africa, II, p. 10.

Storey, H. H. and Bottomley, A. M., *Nature* 2907, p. 97, 1925.

MOSAIC DISEASE.

THE following note on the transmissibility and pathological effects of the mosaic disease by O. H. Elmer (*Iowa Sta. Research Bul.* 82 (1925), *pp.* 39-91, *figs.* 2) appears in the Experiment Station Record for December, 1925.

Accounts are given of investigations on the transmissibility of mosaic disease through artificial inoculations and insect carriers, and of the pathological effect of mosaic in plants and its relation to environmental conditions. Evidence is presented which indicates that the mosaic virus is transmissible among species of plants that are widely separated taxonomically, transmission having been obtained among species belonging to 15 families in 11 orders of plants. Successful infection was obtained on tobacco from mosaic plants of sugar-cane, corn, bean, raspberry, cucumber, crookneck squash, zinnia, calendula, celery, velvet leaf, milkweed, columbine, spurge, and martynia. The tomato was infected with mosaic virus from sugar-cane, bean, crookneck squash, zinnia, calendula, celery, velvet leaf, milkweed, catnip, and martynia. The mosaic virus was transmitted to cowpeas from eggplant, potato, cucumber, and crookneck squash. Petunias became infected with the mosaic virus from cucumber and crookneck squash, the virus from infected celery and spurge plants was transmitted to cucumbers, and *Nicotiana alata* became infected with virus from the bean. Ten new host species of mosaic were found as follows: *Achyrodes aureum, Aquilegia coerulea, A. canadensis, Euphorbia preslii, Abutilon theophrasti, Nepeta cataria, Zinnia elegans, Calendula officinalis, Heliopsis scabra,* and *Stokesia laevis.*

AEROPLANES *VS.* BEETLES.

Aeroplanes will probably be used this summer to assist in exterminating the snout beetle, which is doing extensive damage in bluegum plantations on the Rand. The pest, states the Government Entomologist, is spreading rapidly over the Union and menacing thousands of acres of eucalyptus trees with destruction. The introduction of Australian parasites which kill the beetle may, it is hoped, help to save the plantations. The aeroplanes will be used for the distribution of an arsenical dust over the trees, an innovation that has proved very successful in America. There a specially constructed plane is used, but in South Africa reliance will have to be placed on the Air Force war machines.—*The African World.*

NOTE: The snout beetle referred to above is probably the Eucalyptus snout beetle *Goniopterus scutellatus* Gyll. an insect introduced from Australia into South Africa where it has in recent years developed to the proportion of a serious pest.—Editor, *Tropical Agriculture.*

WEST INDIAN SUGAR.

The Times for 4th March, 1926, publishes a letter from Mr. Albert E. Jacob who was a member of the Empire Parliamentary Delegation to the West Indies during the past season. Mr. Jacob after having had an unusual opportunity of hearing the views of Government officials, members of the local Parliaments, City Councils; Chambers of Commerce and Agricultural Societies, and of inspecting plantations, sugar factories and other industries has written on the subject of Empire Preference principally in connection with sugar. The vital importance of the sugar crop to British Guiana, Jamaica, Trinidad, Barbados, St. Lucia, Antigua and St. Kitts was referred to and it was pointed out that this important industry was passing through a period of extreme depression, in spite of the fact that proprietors have done everything they could to make the industry efficient by central factories, labour saving machinery and scientific research. Mr. Jacob pointed out that the preference in the United States market enjoyed by Cuba and the American colonies has resulted in the development of large central sugar factories installed with American machinery and that this protection gives free entry into the United States to the produce of these colonies, while Great Britain and her so-called "free" trade, taxes sugar and other tropical produce, and draws attention to the fact that while American colonies are flourishing the British colonies are suffering, as an object lesson to the Empire. British trade with tropical colonies is complementary not competitive and diminished purchases in England result in diminished orders from the colonies for machinery and other manufactures. Mr. Jacob makes a strong argument for the repeal of the sugar duty as an important step forward in Empire Preference and states that the Chancellor of the Exchequer in his forthcoming budget has an unique opportunity of pleasing the colonies, relieving unemployment at home and in the colonies and thus forging a new link in the chain of Imperial Unity and Prosperity.

ZULULAND COTTON.

The prospects of the coming cotton season in Zululand are excellent, says the Johannesburg *Star*, and, given average luck between now and picking, planters should recoup themselves for last season. Instead of planting, as had been customary, in November, a month earlier as suggested, and planting in most cases was undertaken in October with excellent results. The cotton planted at that time, to-day is looking particularly healthy. The lack of rain has not affected the growth at all. The acreage this year in Zululand is a little in excess of last season.—*The African World.*

Subscriptions to *Tropical Agriculture* can commence at any time during the year.

TROPICAL WORLD NOTES.

Rhodesia.

The following note on Crop Statistics for the season 1924-25 appears in the editorial section of the *Rhodesia Agricultural Journal* for February, 1926. From this it will be seen that the total area under crops was 334,604 acres, representing an increase over the previous season of 47,767 acres. Cotton was responsible for an increase of 58,911 acres, maize 1,309 acres, tobacco 438 acres, and potatoes 221 acres; while decreases were recorded in the acreage planted to such crops as maize silage, sunflowers, velvet beans, beans and ground-nuts. Maize represented 69.6 per cent. of the total acreage, as compared with 80.8 per cent. in 1923-24 and 82.9 per cent. in 1922-23, the figures for 1924-25 being affected by the increased acreage planted with cotton. The maize crop totalled 1,041,904 bags from 232,947 acres, representing an average yield per acre of 4.47 bags. It is estimated that returns still to be sent in will bring the total to 1,069,000 bags. The area planted with maize in 1923-24 was 231,638 acres and the yield 1,080,084 bags. Thus in the exceptionally dry season of 1923-24 and the abnormally wet season of 1924-25 the yield was very similar. The biggest crop of maize reaped in the Colony was in the season 1922-23, when the yield was 1,505,580 bags, averaging 6.81 bags per acre. The statistics show that in the season 1924-25, 532,633 bags of maize or 51 per cent. of the total crop were grown in the Mazoe district. There were 78 more growers of maize than there were last season, but this increase is entirely confined to those planting a small acreage, as the number of growers with over 300 acres is 15 less.

The disastrous effects of the abnormal rains on the cotton crop are revealed by the statistics published. From 62,858 acres only 5,888,462 lb. of seed cotton were harvested, or 93 lb. per acre. Of the total acreage planted with cotton, 10,786 acres gave no yield at all. The cotton ginned at the ginneries amounted to 4,100 bales of approximately 500 lb. In the season 1923-24, 1,690,538 lb. of seed cotton were obtained from 3,947 acres. The best results with cotton last season were obtained in the Mazoe district, where 15,838 acres gave an average yield of 197 lb. of seed cotton per acre. The Lomagundi district gave an average yield of 167 lb. per acre from 7,454 acres. The number of farmers who planted cotton in 1924-25 was 1,287.

The total area planted with tobacco in the season 1924-25 was 8,441 acres, of which 7,550 acres were Virginian and 891 Turkish. The Virginian crop amounted to 1,987,382 lb., or an acre yield of 262 lb., as compared with 489 lb. in the previous season. The Turkish crop amounted to 418,522 lb. or 469 lb. per acre. The number of growers was 176, of which number 158 grew the Virginian variety.

Sudan.

Before the Manchester Literary and Philosophical Society, on 9th February, 1926, a paper was read on the Rain Cotton in the Sudan by Mr. R. A. Wardle, M.Sc., Professor F. E. Weiss was in the chair, and the following is an abstract of the lecture.

The Southern Sudan is not an ideal area for cotton grown under rainfall conditions, owing to the shortness of the rainy season and to the uncertain distribution of the annual rainfall, but indigenous short staple cottons have been grown for at least 90 years, and experiments have shown that American long staple varieties can be grown successfully and will produce cotton sufficient in quality and quantity to warrant the establishment of cotton cultivation in the Central and Southern Provinces, thus enabling these areas to obtain a surplus of income over expenditure available for developmental schemes.

The Government policy is—

(*a*) In districts where native cottons have previously been grown, to encourage the cultivation of American long staple varieties by issuing free seed and by providing marketing and ginning facilities;

(*b*) In districts where cotton has not previously been grown, to establish experimental cultivation of American cotton at various centres of demonstration and propaganda, to issue free seed, and to guarantee a price for the crop produced.

Progress within the last 2 years has been rapid and prospects are very bright, despite the occurrence of problems concerning suitable varieties of cotton, dates of sowing, agricultural methods, interference of cotton with food crops, provision of transport, and ginning facilities, apathy of native tribes, &c. The ultimate limit of acreage under rain cotton will depend largely upon the extent to which road and rail communications between districts and ginneries can be developed.—*Journal of Textile Institute* February, 1926.

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Tanganyika.

The Commissioner for H. M. Eastern African Dependencies announces that telegraphic statistics just received show the import trade of Tanganyika Territory during 1925 to have amounted approximately to £2,443,000. Great Britain supplied 39 per cent., India 17 per cent., Germany 11 per cent., and Holland 9 per cent.

The Mandatory's domestic exports are returned at a total value of £2,898,000. Cotton and coffee exports increased 78 per cent., and 14 per cent. respectively in weight, the decreases in grain and ground-nuts being 50 per cent. and 52 per cent. These preliminary figures reveal remarkable progress considering the extent of the drought from which Tanganyika suffered.—*The African World.*

East Africa.

The African World, gives an account of a Conference of the East African Governors which opened at Nairobi, on 26th January.

Sir Edward Grigg, Governor of Kenya Colony opening the proceedings as President of the Conference said that the Conference—the first of its kind in Imperial annals, had been initiated at the suggestion of the East African Commission. The Conference will be dealing with, perhaps, the hardest political, economic and moral problems now confronting the governors of the civilised world. He mentioned the patient and unresting experiments in education, medical work, production, and almost every department of Government made necessary by the effect of European progress on the African native. He believed that the settled Highlands would prove of permanent value to the cause of good Government and steady development of East Africa as a whole. He hoped also all European settlements would be encouraged in East Africa wherever suitable highlands existed.

A dual policy of European and native production had been approved by the East African Commission, but it could not thrive unless European and African welfare went hand in hand. Co-operation in all forms of scientific research was necessary to make the growing impact of European influence beneficial to the natives. Nairobi must remain for many years the headquarters of European settlement and that was where political evolution was most advanced. In the matter of Railways, Kenya wanted co-operation from the other territories, not competition.

Sir W. F. Gowers, Governor of Uganda Protectorate said the wider one's experience of Africa the more one became impressed by the necessity of adopting methods and politics to fit the facts as found.

Sir Charles Bowring, Governor of Nyasaland, expressed himself in favour of native production in the reserves, and said natives could not progress without the benefits of European civilization, while conversely European settlers could not make good without the assistance of the natives. He also emphasised the need of the co-operation of all East African territories.

Sir Donald Cameron, Governor of Tanganyika Territory in his speech said Tanganyika was in such a geographical position that most of her neighbours' problems were hers also. He was confident that the discussions would be fruitful and of lasting advantage to the whole of British East Africa which was an important part of the Empire.

The Agenda include the air survey Khartoum-Kissum route, wireless—external, inter-dependency, and internal—postal services, roads—particularly trunk roads connecting the main territories—railway development, motor auxiliary road services, and lake and river transport.

Belgian Congo.

The Bulletin Agricole du Congo Belge for June, 1925, publishes a report of an agricultural inspection trip to Nepoko by M. A. Nannan, Agricultural Inspector of Belgian Congo, in which consideration was given to the possibility of the development of cotton cultivation in this region which was situated between latitude 2° and 3° north and longitude 27° and 29° east at an altitude of from 750 to 850 metres.

The climate of Nepoko is stated to be agreeable and the seasons quite well marked with a relatively dry period from mid-December to the end of March; a rainy season from April to mid-July, a relatively dry season from mid-July to mid-August and a rainy season from mid-August to mid-December. The total rainfall as recorded ranges from 1,373 mm. in 1920 to 1,707 mm. in 1923.

The conclusions given at the end of the report are as follows:

Cotton culture is very possible at Nepoko and promises good results.

Manual labour is abundant and the native is not opposed to work, nevertheless, as is the case everywhere, it is necessary that they be carefully directed and closely watched.

It may be seen from the report of the inspection that good land is abundant.

The quantity of selected seed obtained this year is estimated at nearly 8 tons which will allow of the sowing of 800 hectares for the two territories at the rate of 10 kilogrammes to the hectare.

Precise instructions have been given to the territorial administrators with regard to this campaign.

That success should be assured it will be necessary that two Europeans should be exclusively occupied with this cultivation and that the natives should be given the necessary implements for the preparation of the soil.

Kenya and Uganda.

The total value of domestic exports from Kenya and Uganda during 1925 was 153,725,819s., an increase of 30,088,209s., over the 1924 figures, states H. M. Trade Commissioner at Nairobi, Of the total exports, 54,838,871s. were from Kenya, while Uganda's share totalled 98,886,948s. The 1924 totals were 44,855,198s. and 78, 782, 412s. respectively. The following table shows the quantities of the chief exports during 1925 and 1924:—

Commodity.		1925.	1924.
Cotton	centals	785,848	514,808
Maize	cwts.	1,219,075	1,144,477
Sisal and tow	tons	14,364	11,362
Coffee	cwts.	177,049	201,951

It will be noted that while cotton, maize, sisal and tow all show increases over 1924, a decrease is recorded in the export of coffee.—*The African World.*

MOLE DRAINAGE.

BY H. G. MILLER.

THE aim of the present article is to give a brief description of a practice steadily attracting more attention in Britain, and to discuss its advantages and limitations with special reference to tropical conditions.

Mole drainage is no new idea as it has been practiced for many years to a limited extent in England. At first the work was done by horse power. The implement, known as a mole-plough, was not drawn by horses direct; instead it was pulled across the field by means of an old type of capstan horse gear. Later, much heavier and more elaborate mole-ploughs were put on the market for use with steam-tackle, and now they are being largely developed for direct tractor haulage. This last adaptation, combined with the present prohibitive cost of tile-drainage—which has been, so far, the principal method employed in draining arable land in Britain—are the two main factors responsible for the development of mole drainage.

The Implement and its use.

The principle in mole drainage is to make a tunnel at the required depth by pulling a steel cartridge through the subsoil. With soil of suitable consistency the passage of this implement so compacts the walls of the tunnel as to prevent their collapsing after it has passed. A drain is thereby formed independent of the use of tiles.

In the simplest type of mole-plough the cartridge is attached, by means of a coulter, to a stout wooden beam which is drawn along the surface of the ground. To the front of this beam is fixed a second coulter for cutting the surface vegetation. Such an implement as this can be very easily and cheaply constructed and is all that is necessary for a preliminary trial.

The more modern types are usually provided with two floating wheels, which carry the frame of the implement when not in use. Self-lifting and self-lowering devices are frequently fitted, similar to those on the ordinary types of tractor ploughs, and the fixed coulter is replaced by a disc coulter. Mole-ploughs are obtainable from several British implement makers, for use with either tractors or steam-tackle, their prices being of the same order as those for tractor cultivators and steam tackle cultivators respectively.

The cartridge, which is the most essential part of the implement, has a pointed head and is about a foot in length. The diameter varies in Britain from 2 inches to 3½ inches, the most favoured size at present being 2½ inches. In the "Gopher" plough used in the United States, the diameter is 8 inches which very greatly increases the draught. The optimum diameter for any district can be determined only by trial, depending on such factors as (*a*) the nature of the soil, (*b*) the rainfall, (*c*) the gradient of the field, and (*d*) the area served by any one drain.

The cartridge should be adjustable for depth, but it must be very rigidly clamped in position once it has been adjusted. The usual depth in Britain is 16 inches to 20 inches but a greater depth may be necessary (*a*) where deep steam, or tractor, ploughing is practised, (*b*) where the land is to be subsoiled, (*c*) where it is desired to still further lower the water-table, and (*d*) where the land is not sufficiently compacted at the usual depth for the successful construction of mole drains.

To mole-drain a field is a very straightforward operation. Such questions as those concerned with the placing of the drains and the distances between them are settled by the same factors as in other drainage systems. Only two points need be noted. First, it will be necessary to dig a hole at the beginning of each drain to let the cartridge down into the ground, unless the plough used be of the self-lowering type. Second, the mole drains should empty into open mains and great care be taken to keep their outfalls clear. These mains should, of course, be opened only after the mole drains have been drawn. An occasional practice in Britain is first to open a furrow where the drain is to be laid, and then run the mole-plough along this, its beam moving in the furrow. To reach the desired depth it is not now necessary to set the mole-plough so deep. The result is a reduction in the draught necessary, which enables a lighter type of tractor to be employed.

Advantages of Mole drainage.

Mole-drains possess all the advantages of tile drains with the exception that they are less permanent. The actual length of their life varies considerably, being influenced chiefly by the nature of the soil. From four up to twelve years may be expected, although it is stated that some early 3½ inch drains in England have lasted over 30 years. Their greater cheapness more than offsets this lack of permanence.

Compared with open drains, they possess the following advantages:—

(1) They do not interfere with the working of heavy implements.

(2) They are not liable to accumulate rubbish or serve as breeding places for injurious insects.

(3) Less annual expense is involved in their upkeep.

(4) They can be drawn at much closer intervals than can open drains with consequent beneficial results to a heavy soil.

(5) Since ditches have to be dug after the ploughing is completed, it is frequently difficult to have them ready before the wet season renders them necessary. Mole-drains prevent a farmer from being caught with his drains not dug.

(6) They do not reduce the arable area of a field.

Limitations of Mole drainage.

There are five major conditions necessary for successful mole drainage :—

(1) The subsoil must be of a heavy nature. Such types, as well as being the best suited for mole drainage, also derive the most benefit from the practice. The subsoil may, however, be too light in which case the walls of the drains will soon collapse. On the other hand it may be too heavy. This is seldom the case in Britain but it is highly probable in tropical clays such as are found, for instance, in Trinidad, British Guiana and Antigua. If it is attempted to mole drain land that is very heavy, percolation of the water through the soil will, of course, be very slow, but the rate of drainage will be still further retarded by the practical impermeability of the walls of drains constructed in such soil. In addition there will be the mechanical difficulty of drawing a mole-plough through this soil—even when the latter is sufficiently wet for it to be in its most easily worked condition—and the difficulty of finding a plough sufficiently strong to stand up to the work.

(2) The subsoil must be free of stones.

(3) The subsoil must be comparatively free of roots. Mole drainage is unsuitable for orchard crops like cacao because the more extensive root systems break down the walls and choke the drains. Underdrainage is less necessary for orchard crops, however, than for short period crops receiving more cultivation such as cane, but if it must be employed then the best method is to bush-drain.

(4) The field must have a certain slope. It will be possible to mole-drain perfectly flat fields only when means are devised for gradually increasing the depth of the cartridge as the plough is drawn across the field. Soil may fall into the drains from the walls, and the drains should have a gradient sufficient to keep them washed clear of this. Where the slope of a field is steep, mole-drains may still be useful, but contour open drains must also be dug so as to prevent wash. These latter can serve as the mains into which the mole-drains fall.

(5) The soil surface must be sufficiently even to prevent the drains from being rendered useless by a series of pockets in them. The gradient of a drain, however, need not be absolutely constant, so long as a steady flow is maintained in it and there is no waterlogging. Under suitable conditions it might be practicable, beforehand, to level the narrow strips over which the mole-plough would be drawn.

Adaptation of Mole drainage to the Tropics.

A fundamental drainage problem in the Tropics is that of preventing the humus in the soil from being removed by heavy rains. Open drains are thus a necessity in regions with a heavy seasonal rainfall. Accordingly, mole-drains can not be used alone in such regions ; a combination of the two is necessary. Such a combination would still possess the advantages stated above for mole drainage itself, because the open drains could be made much shallower. In fact a single furrow removed by a plough might suffice. The functions of such a furrow would be confined to the prevention of wash, and the gradual removal of that surface water which could not percolate to the drains. The other factors in drainage, namely the lowering of the water-table, the removal of the surplus soil water and the promotion of soil aeration, would be controlled by the mole-drains. These would also eventually remove any water which gathered in the plough-made furrow, for such a furrow could not be expected to be as carefully "currented" or graded, as are regular open drains.

The land between the furrows should be flat, again to prevent wash, unless the soil is very thickly covered with a crop such as cane ; in that case the "turtle-back" method—common in English pastures on heavy land—might be employed. It is only by actual trial, however, that it will be possible to decide the best means of adapting mole drainage to any particular set of tropical conditions, and of giving a definite verdict on the possibilities of the practice.

Finally there is the important question of whether it would pay to adopt this method. The cost of mole drainage is determined by the nature of the soil, the depth of the drains and their diameter, which determine the draught necessary, and the total length of drains per acre. As these factors all vary with the district and the climate, it is useless to attempt to give definite costs for mole drainage and compare them with those for hand ditching and mechanical ditching. Mole-drains are certainly cheaper than tile-drains and because of their semi-permanent nature, should generally be cheaper than open drains. In Britain it is stated that 800 chains of drains can be completed in a 10-hour day. This is on favourable land using a light type of tractor which consumes about 10 gallons of fuel in the same time.

Mole drainage has thus been shown to possess certain definite limitations which may make it inapplicable to many heavy low-lying soils. There are extensive areas in the tropics, however, where the practice could probably be successfully applied.

REFERENCE.

Mole Drainage by Direct Haulage—Thompson Close—*Journal of the Ministry of Agriculture* (England) XXXII. 4 (July, 1925.)

AGRICULTURE IN SENEGAL.

Although the harvests here have been generally below the average, they have sufficed for the needs of the population, and seed stocks are in hand in sufficient quantity ; indeed, there are considerable reserves for emergencies, and many wells are being sunk for purposes of irrigation in various districts.—*The African World.*

RUBBER DURING 1925.

THE year 1925 was a most eventful one in the history of the rubber producing and manufacturing industries. Wild fluctuations in price were experienced, the minimum being 1*s.* 4¾*d.* on the 4th February and the maximum 4*s.* 8*d.* on 9th December. We have recently received from Messrs. Symington and Sinclair of London a copy of their "Review of the Rubber Market for 1925." in which they state that the World's consumption during the year amounted to 552,000 tons compared with 475,000 tons in 1924. Production at 500,000 tons showed an increase of 80,000 tons over the previous year. Since the introduction of the Restriction Scheme three years ago stocks totalling 159,000 tons have been used up. It is recorded with regret that rubber was dragged into the arena of American politics and made an international question. A considerable amount of inaccurate information was published on both sides of the Atlantic which gave rise to unfortunate and unnecessary abuse. Fortunately the saner elements of the Press refused to enter into the controversy and now it is no longer acute. The prices during the four quarters, February to April 1925, May to July 1925, August to October 1925 and November 1925 to January 1926, averaged approximately 1*s.* 7*d.*, 3*s.* 2*d.*, 3*s.* 7*d.*, and 3*s.* 11*d.*, respectively, so that automatic releases of 10 per cent. each quarter took place under the Restriction Scheme bringing the average exportable quota for the year to 67 per cent. of Standard Production. Beginning at 55 per cent. on 1st February, 1925, by 1st November, 85 per cent. had been reached, and it was expected that the quota would have risen to 95 per cent. on 1st February, 1926. As already announced on our Market reports, the Colonial Office decided to raise the quota to 100 per cent. on 1st February. Some small concessions were also made with regard to old stocks of rubber and the revision of Standard Production to a maximum of 500 lb. per acre.

The net exports of rubber from Malaya amounted approximately to 198,000 tons, but in addition re-exports of foreign rubber added another 119,000 tons of dry rubber after deducting 30 per cent. for moisture and dirt. The total exports were valued at £88,500,000 compared with £31,590,000 during 1924, so that the prices per lb. were roughly 2*s.* 6*d.* and 1*s.* 1*d.* respectively. The export of rubber from the Dutch East Indies is estimated by Messrs. Symington and Sinclair at 190,000 tons. Ceylon exported 42,000 tons or 2,000 tons less than her exportable quota. This fact appears particularly worthy of attention in view of the recent agitation to have the basis of Standard Production in Ceylon raised to 500 lb. per acre. According to the estimates of the Rubber Association of America, the United States consumed 385,000 tons of rubber during 1925, showing an increase of 51,000 tons over 1924. This accounts for nearly 70 per cent. of the total world consumption, and of this amount it is interesting to note that the tyre trade accounted for 84 per cent. The United Kingdom with a consumption of 30,000 tons showed an increase of 3,000 tons, over the previous year. France with 36,000 tons an increase of 1,000 tons, and Germany with 37,000 tons, the large comparative increase of 14,500 tons or 64½ per. cent. Russia is again entering the rubber market and her consumption increased from 900 tons in 1924 to 9,000 tons in 1925. Other countries call for no special comment, except Japan which, with a consumption of 13,000 tons, showed a decrease of 4,000 tons.

Stocks available in consuming countries have not been so low for many years. In the United States of America manufacturers and dealers are estimated to have had 51,000 tons in stock at the end of 1925 or little more than half the amount held at the corresponding period of 1921. Stocks in the United Kingdom bear no comparison with recent years and amounted to only 6,000 tons, or less than one-thirteenth of the amount at the end of 1922. Amounts immediately available in producing countries are estimated at 151,000 or less by 48,000 tons than in 1924. Since this amounts to less than three months consumption, any delay in shipping or production is likely to cause wild fluctuations in price; particularly in view of the habit of manufacturers to maintain their reserves at a minimum. With restriction at 100 per cent., maximum production is practically reached but many authorities doubt the ability of the industry to reach this output. In the report under review the average maximum production per acre for Malaya is estimated at 336 lb., for Ceylon 330 lb., and about the same for the Dutch East Indies. On a similar basis the total world production for 1926 would amount to 626,500 tons made up as follows:

Malaya	283,000
Ceylon	64,000
Dutch East Indies ..	199,500
Other Planted Areas ..	37,000
Para Grades	32,500
Wild Rubber	10,000
	626,500

Costs of production during 1925 showed a slight increase over 1924 ranging from 7.50*d.* to 12.40*d.*, with an average of 9.72*d.* per lb. for 80 large Malayan producers, compared with 9.68*d.* for the previous year, and from 7*d.* to 12.7*d.*, with an average of 9.23*d.* per lb., for 20 British plantations in the Dutch East Indies, compared with 9.13*d.* for 1924. With an increased output during 1926 one would normally expect a reduction in costs but this is likely to be completely offset by increased labour costs.

Messrs. Symington and Sinclair estimate the consumption of the United States of America during 1926 at 415,000 tons. It is also expected that the United Kingdom will show an increase of 10 per cent., France of 1,500 tons and Germany

20 per cent. The total world consumption is expected to be about 603,000 tons so that about 23,000 tons will be available for increasing stocks. Higher prices have stimulated the production of "reclaimed" rubber and it is anticipated that during 1926 a further increase will be realised. Tests have shown that any large additional admixture of reclaimed rubber in the manufacture of tyres considerably depreciates their wearing qualities, so that most of this rubber will probably be applied to the manufacture of the many other articles in which rubber is utilised. If consumption continues to increase at the present rate, even after making a generous allowance for increased production, a shortage appears to be indicated by about 1928 so that there appears little prospect, during the next few years of a continued period of low prices.

PALM KERNELS AND GROUND-NUTS.

Another Empire Growing Association.

THOSE with any knowledge of the West African trade will not have been surprised by the recent suggestion by the Colonial Office that the Trade should consider very carefully the possibility of forming an association to do for the palm kernel and ground-nut industries of the West Coast, what the British Cotton Growing Association as so successfully achieved in another sphere. The functions of the proposed association would be first of all to initiate the establishment of factories in Nigeria for treating the raw material, to organise a proper supervision of the quality of the produce, and finally undertake pioneer work in establishing cultivation on a scientific basis. The gradual decline in the quality of the crop and the non-existence of adequate organisation for collection and transport has rendered such a step imperative, if the trade, which in the past has been a valuable one, is not to pass to competitive colonies of other powers who are alert to its inherent possibilities.

Proper inspection of the produce, the first problem to be tackled, is felt by all concerned to be most urgent. It is estimated that the value of Nigeria's output for 1924 was £300,000 to £400,000 below its possible value owing to depreciation, due to shell dirt and other extraneous matter and loss of weight owing to soaking. This was due to faulty and careless handling of the kernels and could have been avoided had proper precautions been taken to make it conform to the home standards of purity.

Bad quality has been even more strongly in evidence in the Gambian ground-nut crop for last year. Its price at the close of the season being as much as £2 per ton lower than that obtaining in the neighbouring French colony of Senegal. In this instance blame is laid upon the quality of the seed used, rather than any other likely cause, and the Colonial Office has intimated its approval of the importation into Gambia of disease-free and disinfected seed from Senegal until such time as the Government seed farm is able to supply sufficient quantities of approved seed.

One of the chief sources of ground-nut is India and the present crop is stated to be good. Although the total area in the three important provinces of Madras, Burma and Bombay under cultivation (comprising approximately 94 per cent. of the Indian area under ground-nut) shows a decline of 1 per cent. over that cultivated in 1923-24, yet the estimated yield shows an increase of about 30 per cent. This improvement is ascribed to the beneficial rains in the latter part of the year which more than made up for the drought earlier.

The restriction of area under ground-nut in India is difficult to account for. Market prices have, of course, been falling during the last year, and this may have considerable influence. Especially when we take into account the high level maintained in the rape seed market. This appears to have attracted cultivators, if we are to judge from trade returns. The imports of rape seed into the United Kingdom from the British East Indies during 1924 show an increase of 13 per cent. over the same commodity for 1923. The supplies for the English market are to-day practically entirely derived from India. In this respect India has entirely taken the place of Russia, which in 1913 was the most important source of the world's rape seed, both as regards quality and quantity. During 1924 we imported 67,750 tons of rape seed from the British East Indies and only 911 tons from other countries. And from 1st January to 30th April of the current year our total imports have been 9,251 tons, of which the British East Indies supplied all but 66. To-day Russia sends us no rape seed at all, although our imports of Russian linseed are steadily increasing. This lack of competition in the rape seed market has kept prices high, the rape seed oil prices being in fact the only ones to remain unaffected by the consistent downward movement of the oil market as a whole since the beginning of the year.

With better organisation of other sections of the oil supply such as the West African, it is certain that the market will continue to fall, although it is doubtful whether we shall ever reach the low figures of the pre-war era, which to-day appear incredible. It is doubtful whether such a level is to be desired—a proper relation to the other markets would appear preferable. What is important, however, from an Imperial point of view is that the colonies should organise their young industries upon the most efficient lines, and to this end we feel that the formation of such an association as that already mentioned is a most pregnant step.—*The Industrial Chemist*, June, 1925.

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THE AFRICAN COFFEE INDUSTRY.

ACCORDING to *The Tea and Coffee Trade Journal*, March, 1926, the Department of Commerce, Washington, has received the following report on the growing and marketing of coffee in East Africa :

" Several varieties of coffee exist in East Africa, but the principal ones are *Coffea robusta, engenioides, excelsa, arabica,* and *liberica.* The *robusta* and *engenioides* are indigenous while the other three kinds are imported. Two have been found commercially desirable, the *robusta* and *arabica,* but the latter has proved the more valuable as it grows well in higher altitudes and possesses better liquoring qualities. All coffee exported from this region, however, is shipped as " Kenya " or as " Uganda," the " Kenya " brands always commanding higher prices.

" In 1920 there were 27,813 acres under coffee, and the rate of increase since that time has approximated 20 per cent. each year over the immediately preceding year. Up to July, 1925, there were 65,000 acres under cultivation, classed as follows : Acreage of trees up to three years old, 30,394 ; trees three to six years old, 14,463 acres ; over six years old, 20,603 acres. Experience has taught the coffee growers that the best spacing for trees is 10 by 10 feet, thus making 435 trees to the acre, or 28,275,000 for the entire county.

" Some of the best coffee land will, under normal conditions, produce one ton of clean marketable beans an acre, and a half-ton an acre annually is quite common ; but a large area of unsuitable land is planted to coffee, the production on which is so small that it brings the general average of the entire country to about 5 cwt. to the acre, or slightly more than one pound a tree.

" The principal harvesting season is from September to January. During July, following the long rains, there is a fairly good picking season, but between these main seasons coffee in small quantities is continually maturing and furnishes what is termed ' fly ' picking, which barely pays working expenses ; but it is for the good of the trees that these small quantities of berries are not allowed to remain.

" Coffee, like other products of East Africa, is shipped as soon as harvested, since there are practically no storage facilities in the country. During the past years, Kenya has produced a very high-grade coffee due to favourable climatic conditions. The average price was about 27 cents a pound.

" Thirty and a quarter million pounds of *arabica* coffee were exported from Mombasa during 1924. The principal countries of destination and their proportion of the exports were the United Kingdom with 59 per cent. ; Holland 8 per cent. ; Egypt 7 per cent. ; France 6 per cent. ; Union of South Africa 3.5 per cent. ; Red Sea Ports 6 per cent.

" The coffee is put into a double container consisting of two gunny sacks, each weighing 2½ pounds, and this container holds 187 pounds of coffee. It is shipped by rail to Mombasa from the curing factories, the proprietors of which act as shipping and commission agents for the grower. These agents will advance money up to 60 per cent. of the current market value of the coffee, or negotiate with banks to make these loans. Every grower having 50 acres or more of coffee has his own private brand, and these brands are becoming so well known in London that the coffee is frequently bought simply on its reputation. It has been the custom, however, to advertise the sale of various coffees, and intending purchasers secure samples and have them tested for liquoring qualities which determine the bidding prices at the sale."

COFFEE IN BRITISH GUIANA.

A ROUGH estimate by the British Guiana Department of Agriculture places the production of coffee at 900,000 pounds, of which 600,000 pounds are Liberian and the remainder Arabian, or Creole coffee as it is called locally. The Liberian coffee grows more successfully here and is the most popular type among natives. The official figure for the acreage in 1924-25 is 4,096 acres, a decrease of 144 acres from 1923-24, and a decrease of 1,062 acres from 1918, when a maximum acreage of 5,158 was under cultivation. The estimated amount of coffee used locally is 225,000 pounds, or one-third the amount exported, which in 1925 amounted to 668,029 pounds. Of the total amount, 653,732 pounds were shipped to the Netherlands. No green coffee was imported during the year, but 1,073 pounds of roasted coffee were brought in, 532 pounds of which came from the United States.—*The Tea and Coffee Trade Journal.*

COFFEE IN KENYA.

ACCORDING to the offical coffee census taken in Kenya Colony, the area devoted to that product on 30th June, 1925, was 65,140 acres, an increase of 8½ per cent. for the year. The figures for five years are as follows :

	Total Area.	*3 to 6 Years.*	*6 Years and over.*
	Acres.	*Acres.*	*Acres.*
1925	65,140	17,713	21,203
1924	60,054	13,269	18,902
1923	52,249	9,619	17,128
1922	43,359	9,474	13,748

The Tea and Coffee Trade Journal.

HAITI COFFEE AND CACAO.

Exports of coffee from Haiti for the year ending last 30th September amounted to 30,767,100 kilos, against 29,402,000 in the year preceding and exports of cacao were 1,533,772 and 1,647,029 kilos respectively. Coffee exports in 1925 were valued at 75 per cent. of the grand total of all exports, a gain of 5 per cent. during the year.—*The Tea and Coffee Trade Journal.*

HONOURS FOR AGRICULTURISTS.

The Kew Bulletin of Miscellaneous Information, No. 2, 1926, gives the following note of appointments in the recent New Year's Honours List :—C.M.G., Mr. S. Simpson, Director of Agriculture, Uganda. Also the following promotions in, and appointments to, the Order of the British Empire on the occasion of the ending of the British Empire Exhibition :—C.B.E., Mr. A. Holm, Director of Agriculture, Kenya ; O.B.E., Mr. A. H. Kirby, Director of Agriculture, Tanganyika Territory, and Mr. J. F. Wortley, M.B.E., Director of Agriculture, Nyasaland Protectorate ; M.B.E., Mr. T. D. Maitland, Botanist, Agricultural Department, Uganda, and Mr. W. H. Patterson, Entomologist, Agricultural Department, Gold Coast.

ZEBRA AS PESTS.

ZEBRA in the plateau district of Kenya Colony are being rounded up in a businesslike manner, as it has long been found impossible to grow crops and stock Zebra at one and the same time, reports the Nairobi correspondent of *The Star*. In addition, the price of a skin of zebra, *7s. 6d.*, is sufficient to threaten the total extinction of this East African pest. The beasts are being killed off systematically by groups of three hunters, one man driving while the other two do the shooting. In time the zebra will learn to leave the crops alone and seek pastures new.—*African World*.

THE PADI FLY IN MALAYA.

AN article in the November, 1925 number of the *Malayan Agricultural Journal* gives an account of recent outbreaks of the " Padi Fly " or " Rice Sapper," names given to various species of *Leptocorisa*, which, both as nymphs and adults suck the juices of developing grains of rice when they are in the milky stage. These insects are distributed very generally throughout Malaya and are to be found in the padi fields each year, though generally in such small numbers as to do but little damage. In most seasons, however, they occur in a few localities as pests serious enough to destroy an appreciable portion of the crop.

In the district referred to in this article, these pests occurred in serious numbers during the harvest of 1924 to 1925. Many of the Malay rice farmers who usually grow sufficient padi to supply their wants were compelled to purchase rice six weeks after harvest. The persistent appearance of this insect in the fields year after year and their only occasional occurrence in sufficient numbers to do material damage indicates that they are native insects generally held in check by their natural enemies.

The methods of control, which appear to have been fairly successful when carefully carried out, are of interest. The adult insect flies only a short distance at a time and not very rapidly. They were captured by means of a sticky substance on twigs, leaves, bits of cloth and net which were waved over the infested plants ; the insects being disturbed left the plants and were caught and held by the sticky mixture. This mixture was prepared by the natives themselves from various jungle plants and the Forestry Department provided them with a quantity of Keruing oil for the purpose. The nymphs or immature insects were collected by shaking the infested heads of padi over pans or receptacles containing water mixed either with the juice of limes and wood ashes or a little kerosene oil. It was also found that the eggs could be collected but as the eggs were parasitised by minute hymenoptera it is advised that the eggs be not destroyed ; the portions of leaf on which they are found can be put into cigarette tins where the parasites will have an opportunity to emerge. If the tins stand in a tray or pan containing water with a few drops of kerosene oil added the nymphs of the padi fly will be caught if they hatch from the eggs and attempt to escape, while the parasitic insects being able to fly will be free to return to the padi field and search out and parasitise other eggs.

It was found that for these measures to be of value it was necessary for concerted action throughout each community. This was accomplished by applying existing ordinances by means of which the whole population adjoining each plantation could be compelled to turn out and carry on the work as directed. It is felt that this method of control is capable of being applied so as to give a very valuable protection to the crop. In the intercrop season the Malays are encouraged to cut down and burn all grasses on the edges of padi fields to deprive the surviving insects of food. Swarms of adults have been found in weedy rubber holdings or patches of jungle and these insects have been destroyed by the methods used in the rice fields. During this period no case has been recorded of either eggs or nymphs being found.

The following conclusions are given :

1. Co-operative and organised use of an easily applied and inexpensive method of catching these insects provides an effective control.

2. It is important that all the padi in any one sawah (padi field) should come into flower as nearly as possible at the same time. This point is understood by Malays. It can be attained in permanently irrigated areas, where it should be enforced. It is, however, unattainable where water supplies are irregular.

3. It is important to destroy the padi fly when it first appears in small numbers.

4. It is important to clean the edges of padi fields from grass, so that the insects have no supply of food near the sawahs after the padi harvest.

5. After harvest, swarms found in rubber holdings or in the jungle or elsewhere should be destroyed.

REVIEWS.

EFFICIENT MARKETING FOR AGRICULTURE, by Theodore Macklin. The Macmillan Coy., New York, 1924, pp. xviii+418.

UNTIL within recent years the marketing of agricultural products had received but scant attention as a special branch of economics, though scarcely an individual in any modern community can hope to escape the good or evil effects of the system. The stress of the post-war depression in particular, and the growing interest in prices in general, have stimulated considerable interest in marketing, one of the most complex and least understood—or rather most misunderstood—phases of economic relationships. Agriculture, one of the oldest of the world's industries, has been slow to respond to the play of those forces whose effect upon the manufacturing industries has been designated as the "Industrial Revolution." Agriculture was originally, and to a large extent has remained, a self-sufficing industry, a fact not true to anything like the same extent of any other industry. When the individuals composing the agricultural unit produced all they needed and consumed all they produced, problems of marketing, in one sense, did not exist. Even when the market was enlarged from the family to the village or district, agriculturists produced for known customers and the problem of marketing existed in a very elementary form. With the introduction of modern means of transport the market lost its local characteristics and became national, international and even world-wide. The activities of the agriculturist are no longer governed solely by his own, or his family's or his district's, needs, but by the demands of the nation or world. He has been compelled to specialise in the cultivation of those products which, all things taken into consideration, offer him the best prospect of adequate reward—not necessarily, be it noted, those for the cultivation of which his land is best adapted. He frequently finds it more profitable to sell his produce to middlemen than to search out consumers himself. Now the middlemen render services to both producer and consumer not by producing physical commodities, but by rendering certain necessary services. Criticism is erroneously levied against the middlemen because they produce no tangible commodities, in consequence of which they are frequently regarded as "parasites of industry." Producers and consumers are apt to lose sight of the fact that they can, if they desire, perform these services themselves either co-operatively or individually and receive the remuneration now paid to the middlemen. Whether the middlemen perform their services well or ill is a question open for considerable discussion, but there can be no doubt that the services they render are essential. Real efficiency lies in a nice balance between expert management, volume of business and other essential factors which allow the rendering of all the essential marketing services at minimum expense. The system may suffer in efficiency from under or over sized units, too much or too little specialization, etc., etc. But the system is subject to continual change. The efficient unit of to-day may be a very inefficient unit to-morrow, and it is the continued lag between what is and what ought to be which occasions those mal-adjustments against which criticism should be, but frequently is not, directed. The efficient marketing system besides meeting the needs of to-day in an adequate and economical manner should be capable of adaptation to meet the changed conditions to-morrow. It is with this background that the author develops his exposition of the methods of marketing, analyzing and criticising the functions performed by the various types of middlemen, and suggesting means by which the mechanism can be adjusted in order that these essential services may be performed more efficiently and economically. To those who desire an elementary explanation of the functions of marketing this book can heartily be recommended.

C. Y. SHEPHARD.

THE United States Department of Commerce has recently issued in bulletin form. ("Trade Promotion Series." No. 2, price 50 cents, obtainable from the Superintendent of Documents, Washington, D.C.), an illuminating survey of the plantation rubber industry in the Middle East. The subject is treated in some 300 pages, including statistics and illustrations. The geographical region covered comprises Ceylon, India, Burma, Malaya, Netherlands India, Indo-China, British North Borneo, Sarawak, Brunei, Siam and the Pacific Islands—95 per cent. of the world's rubber area at the present time. The economic factors surrounding the industry are discussed with special reference to costs of production and the extent to which increasing demands can depend on output from the present planted area.

In connection with costs of production, the report notes the considerable variation that exists but draws attention to the reductions effected by a change of methods during the past few years and indicates possibilities of still further savings. At present the cost of developing and maintaining an acre of rubber to the producing stage is placed at 200 to 400 dollars United States currency. In 1922, the cost per pound in the more important centres varied from 12-7 cents to 17-4 cents United States currency, the latter figure including insurance and freight to consuming markets.

Figures dealing with capital invested place Great Britain in the fore of interested countries with 500 million dollars, Netherlands next with 130 million dollars, while the United States stands fifth with 32 million dollars. Great Britain controls about 75 per cent. of the total acreage, while the United States consumes about 70 per cent. of all the rubber produced.

An estimate by the Rubber Association of America of future potential world production and consumption gives production in 1926 as 606,000 tons and consumption 575,000 tons; during 1927 and 1928 production is expected to be slightly in excess of consumption, but in 1930 the figures are: production 641,000 tons, consumption 703,000 tons.

Summarising the main cultural practices in connection with the crop, it may be noted in the first place that approved planting methods at the present time are: clean clearing and removal of all timber and stumps; close planting—about 200 trees per acre—with early thinning out, eventually to 70 or 80 trees per acre; conservation of soil and rainfall on slopes by terracing, digging of pits, construction of bunds, use of cover crops, etc. In regard to propagation, while much is expected from bud grafting, this method is still in the experimental stage. Selection of seed from high yielders is also being attempted. Fertilising has not resulted in any appreciable increase in crop except in isolated instances where especially poor soils have been met with; the general belief, however, is that such treatment helps to maintain the trees in health land vigour and may prevent a falling off in yield.

Touching on tapping systems, it is pointed out that these have undergone a complete change during the past three years. Daily tapping has been generally replaced by alternate-day tapping or periodic tapping (tapping daily for a period and resting for a period). The almost universal limit is one cut per tapping—usually on half the circumference, but sometimes on one-third, one-quarter or one-sixth. Experiments with tapping systems are constantly in progress.

There is insufficient evidence, it is claimed, on which to base deductions regarding the life of a rubber plantation. While on good soil and properly cared for it would be impossible even to venture a prophecy, many companies are providing for a 30-35 year life either by extensions to their plantings or building up an amortization fund. A 400-lb. yield per acre is regarded as a figure which should be reached by the time the trees are ten years old and maintained for a number of years thereafter. It is recognised, however, that this yield cannot be obtained under all conditions.

As with other crops, attention has to be given to pest and disease problems, but it is satisfactory to note that no trouble of this nature at present menaces the industry as a whole.

Finally it would appear that if recent developments taking place in the actual preparation of plantation rubber prove permanent, much of the present factory equipment will be scrapped.

J. S. D.

The Editor requests that any subscriber who fails to receive *Tropical Agriculture* regularly should communicate with him immediately in order that the matter may be rectified.

CORN SUGAR APPROVED.

ACCORDING to *Facts About Sugar* the United States Senate has recently passed the Cummins corn sugar bill with an amendment including fruit sugar also. The effect of this amendment is to exempt corn sugar and levulose from the requirements of the pure food law as to labelling products in which they are used to show that these forms of sugar have been employed. The report from the Committee on Manufactures said: "The information presented to the committee shows that the present production of corn sugar has been largely developed within the past two years; that it is a supersugar nearly 100 per cent. pure; that as a preservative it has nearly 30 per cent. average over cane or beet sugar and that 25 pounds of sugar can be obtained from a bushel of corn. The hearings showed further that former rulings have designated cane sugar as sucrose and corn sugar as dextrose."

"There is nothing in the pure food law to prevent the use of corn sugar as a preservative and in sweetening canned goods, but owing to the fact that it has been designated as dextrose there has been doubt in the minds of the manufacturers as to whether or not the product can be used in connection with the canning of food products unless it is named on the label as dextrose. The feeling among corn producers is that this intimation is inimical to the use of sugar made from Indian corn; hence the reason for this amendment to the pure food act. It was brought out in the hearing that it is possible to develop a material increase in the market for Indian corn."

The proposal to include fruit sugar as an amendment to this bill appears to have arisen from the success which has attended experimentation at the Bureau of Standards in developing a process for crystallizing levulose extracted from artichokes from which a great expansion in the cultivation of artichokes and considerable development of sugar therefrom is expected.

The levulose obtained from artichokes is said to be 75 per cent. sweeter than sucrose obtained from sugar beets and cane, and the ease with which a large production of artichokes can be obtained makes the plant an important potential source of sugar supply.

JAVA MILL ELECTRIFIED.

THE first sugar mill in the Dutch East Indies to adopt electric motors for main roll electrification is the Radjo Agoeng Sugar Mill of the Oei Tiong Ham Suikerfabrieken. Two 1,000-kilowatt turbine generators will be installed, rated 440 volts, 3 phase, 60 cycles, with variable frequency governor. The electrical equipment will also include five 250-horsepower, 450-r.p.m., slip ring motors with hand operated control equipment for 15 per cent. speed reduction, switchgear and station cable. General Electric equipment will be used throughout.—*Facts About Sugar.*

SAMOAN CACAO.

IN view of the interest recently aroused in the methods of marketing cacao, the following particulars regarding the grading of cacao may be of interest to readers:

The export of cacao from this country (Samoa) is regulated by the Cacao Beans Export Ordinance, No. 9 of 1923. A committee consisting of three members appointed by the Administrator is responsible for the working of the Ordinance, the act or decision of any two of the members being deemed the act or decision of the committee. No person is allowed to export any cacao beans from Samoa unless such beans have been first examined by the Committee. All cacao beans for export must be packed in clean new bags each of which is clearly marked with the brand indicating the owner. For the purpose of examination by the committee, all cacao beans must be stored by the owner in the Customs export shed, or other place appointed by the committee, at least 24 hours before the time of intended shipment. At the time of storing the owner must give the committee written advice specifying the number of bags, total weight, brand and owner's name and address, etc. When there is any marked difference in the quality of the cacao beans submitted for examination in one lot or under one brand, the owner must submit such beans in two separate parcels, each of uniform quality, with a distinguishing mark on all the bags of the parcel. At the same time the owner must submit to the committee the bill or bills of lading under which he proposes to ship the cacao beans. If the above provisions have not been complied with, the committee has the power to refuse to examine the cacao beans. Any person wilfully supplying false or misleading information, or who wilfully omits to supply any information required, is deemed to have committed a breach of the Ordinance. The owner undertakes transmission to and from the place of examination, storage, opening, re-bagging, insurance, etc.

In the case of parcels of cacao beans conforming to the standard required by the committee for good quality cacao, the bill of lading relating to such parcel is stamped on behalf of the committee, "Standard Quality Cacao." Cacao inferior in quality to this standard is marked on behalf of the committee with the words, "Inferior Quality Cacao," if the Committee thinks that the inferiority is so marked that in the interest of cacao producers in Samoa the bill of lading should be so stamped but, otherwise, the committee does not cause any stamp to be put on the bill of lading except in the case of native cacao. In the case of cacao beans grown or sold by a Samoan, or mixed with beans so grown or sold, the committee may, in its discretion, stamp the bill of lading with the words "Native Cacao." In the case of cacao which, in the opinion of the committee, is of such quality that in the interest of cacao producers in Samoa, it ought not to be exported, the committee may prohibit the export of the same. The owner of such cacao is at liberty to remove such cacao and to re-submit it for examination after re-sorting or re-conditioning. Should the owner of any cacao of which the committee has prohibited the export be dissatisfied with the decision of the committee, he may appeal to the High Court for an Order calling upon the committee to show cause why such export has been prohibited, the decision of the High Court to be final. Otherwise there is no appeal from any decision of the committee. It is laid down that the quality of any parcel of cacao beans is to be determined by the committee only after opening and inspecting the contents of such parcels. Any person committing a breach of this Ordinance is liable to a penalty not exceeding £100.

TRINIDAD CACAO.

IN connection with the grading of cacao, it is interesting to note that at the meeting of the Trinidad Chamber of Commerce on Wednesday, 31st March, the amended report submitted by the committee drawn from the various interested bodies, was rejected by the members of the Chamber. The reasons advanced for the rejection of the report were, that while the suggested mechanism appears very satisfactory on paper, it would not work smoothly in practice, and secondly that the introduction of grading would cause too great an interference with business. Supporters of this attitude appear to have overlooked the fact that such methods are already in practice and working smoothly in connection with cacao in other countries, and that grading has been introduced into the marketing of cacao and other important tropical products for the purpose of assisting, and not hindering marketing.

One member of the Chamber in calling attention to the low prices realised for Trinidad and other superior grades of cacao, quoted the reports of purchasers abroad to the effect that the demand for superior Bahia cacao was rapidly taking the place of the previous demand for the superior growths, *e.g.*: "The feature at the present moment is the great difference existing between the prices of superior Bahia and Trinidad." "Some of them (buyers of cacao) substitute superior Bahia for Trinidad and this procedure is increasing." "Our big chocolate manufacturers (in Europe) are substituting cheaper grades of cacao, particularly Bahia."

In connection with the increasing popularity of Bahias, one recalls the fact that Brazil introduced a system of compulsory grading as from 1st January, 1926. One wonders whether these two factors are connected with one another?

C. Y. S.

The Editor will be pleased to send a gratuitous specimen copy of *Tropical Agriculture*, post free, to anyone interested in tropical development.

COLLEGE NEWS.

THE Principal sailed for England in the s.s. *Motagua* on the 16th March.

Mr. E. E. Cheesman, lecturer in Botany, paid a visit of a few days to Tobago during the Easter holidays.

Messrs. I. E. James and B. G. Owen, Post-Graduate Students, visited Tobago during the Easter holidays in connection with their College studies.

Mr. C. T. Watts, Technical Assistant to the Principal, left Trinidad for the United States on 30th March by the s.s. *Vauban* on three months vacation leave.

His Excellency Sir Horace Byatt, Governor of Trinidad and His Excellency Sir Frederick Seton James, Governor of the Windward Islands visited the College on 29th March.

Professor C. Y. Shephard, visited British Guiana during the Easter holidays with the object of making a study of the working of the local Co-operative Credit Societies.

Professor S. F. Ashby, who is leaving the College to take up his duties as Mycologist to the Imperial Bureau of Mycology, is expected to leave Trinidad by the s.s. *Camito* of the Elders & Fyffes line on 21st April.

Dr. H. R. Briton-Jones, who comes to the College as Professor of Mycology and Bacteriology in succession to Professor Ashby, sailed from England on 10th April, and is expected to arrive in Trinidad on 24th April.

First Year Diploma Students visited St. Clair Experiment Station on 12th March, and were kindly conducted through the nurseries by Mr. R. O. Williams, Curator. They observed plant propagation on a large scale and the activities of the Station generally.

It is announced that His Majesty's Government has made a grant to the College of £15,000, towards the cost of erection and equipment of the proposed hostel, and maintenance grants of £3,000 per annum in 1926 and, if needed, £3,000 in 1927, £2,000 in 1928 and £2,000 in 1929.

Mr. J. A. McDonald, Second Year Diploma Student, playing for the St. Augustine Club reached the semi-finals in the men's doubles in the Open Tennis Tournament at Tranquillity Club, Port-of-Spain. With more experience in tournament tennis McDonald may be expected to take his place among the first class players in Trinidad.

Mr. P. E. Turner, lecturer in Chemistry at the College, will be seconded for duty in connection with the investigations of the Froghopper Committee which is to be maintained by a joint fund provided by the Government and sugar planters of Trinidad. Mr. Turner will carry out investigation on the cane soils and will work in the College laboratories.

On another page in this issue will be found a notice of a paper by Dr. Withycombe which appears in the latest number of the *Journal of Applied Biology*. Dr. Withycombe's paper offers a comprehensive account of the progress made in the study of froghopper blight from the time covered by Mr. C. B. Williams' monograph on the subject which appeared in 1921, up to the present time when the investigations of the froghopper committee are commencing.

A Science Club has recently been organised with members who are engaged in the practice or teaching of science. The Hon. W. G. Freeman, Director of the Trinidad Department of Agriculture has been elected President. Dr. H. Martin Leake, Principal of the College and Dr. T. G. Mason, Chief Plant Physiologist of the Cotton Station of the Empire Cotton Growing Corporation, are the Vice-Presidents. The Secretary and Treasurer is Mr. W. Nowell, Vice-Director of the Trinidad Department of Agriculture. The meetings of the Club are to be held in one of the rooms at the College.

Through the courtesy of the General Manager and Staff of Usine Ste. Madeleine, the College Department of Agriculture was able to arrange a very successful excursion for the post-graduate and the Second and Third Year Diploma Students, on Saturday, 20th March. The party, including Professors Hardy, Dash and Shephard, journeyed by train to San Fernando where they were met and taken to the Usine by bus and motor cars. After being shown the working of the entire factory, the excursionists were entertained at luncheon by Mr. Skinner at his residence, when Professor Dash took the opportunity of expressing the thanks and appreciation of those present, to which Mr. Skinner replied that he hoped such visits would take place annually. The field programme was next carried through, the party returning by the afternoon train after having spent a very profitable day. The facilities offered by the railway were also much appreciated.

Under the captaincy of Mr. L. S. Birkett, the College Cricket Club played seven matches against various clubs and of these three were won, three lost and one drawn. The outstanding batsmen have been F. Bain and the Captain, with averages of 37 and 32 respectively. Bain has the credit also of being the only batsman who made a century for the College. In bowling, the honours again fell to Bain, and his performance in capturing 21 wickets at a cost of 5.3 runs per wicket is very creditable; Archer with 7 wickets for 63 runs and Birkett with 13 for 165 were the most successful of the other bowlers. Mr. Birkett played for Barbados against the M.C.C. team in January, making a score of 60 not out. Mr. Bain was selected to play for Trinidad in the Intercolonial Tournament at British Guiana, but decided not to accept the invitation to accompany the Trinidad team, as the match was played in October and would have necessitated his absence during the first weeks of the College session.

TREND OF THE MARKETS.

[*The notes below are based principally upon running charts of the prices of the basic grades and upon general statistical information gleaned from contemporary publications and cablegrams and are intended to be a record of movements. An attempt is made, where possible, to indicate the market outlook at the time of going to press, but no responsibility for the accuracy and subsequent truth of such observations is assumed. Unless otherwise stated the prices quoted are spot, London.*]

SUGAR.—The sugar market for the most part remains in a depressed condition and spot prices show an indication of further slight declines. Buyers both in America and Europe are indifferent to purchase of anything but the barest necessities. Nevertheless the feeling prevails in some quarters, that the present weakness is of a temporary nature and there will be a return to more normal conditions in the near future. Futures are higher than current values, an unusual position, indicating a possibility of some recovery.

COTTON.—Since our last report prices have shown a sharp and steady decline, chiefly as the result of considerable long liquidation. More recently prices have not shown any decided tendency and business has been small. New crop prospects continue to be favourable although it is suggested that if the decline in price continues acreage will be reduced. Mid-American closed at 9.81*d.* per lb. on 11th March. On 8th April West Indian Sea Island Cotton c.i.f. realised 3*s.* 6*d.* per lb.

COCOA.—The demand for cocoa has strengthened slightly. The market has been influenced by a continued speculative demand for the cheaper grades of cocoa, but attempts to effect sales in better grades have shown that the market is weak and that little support can be expected from manufacturers. Prices on 10th March were Ceylon Ordinary 101*s.* 3*d.*, Trinidad Middling Red 76*s.* 3*d.*, Grenada Fine 66*s.* 3*d.* and Accra Fermented 42*s.* 6*d.*

COFFEE.—The demand for coffee has been less active and in consequence prices have shown some decline. Costa Rica stood at 150*s.*, Kenya Good Middling at 120*s.* and Brazil Santos at 95*s.*, all on 10th March.

TEA.—Tea remains a strong market and prices have shown a tendency to rise, the increase in those of Indian teas being particularly noticeable, but this has been largely due to the heavy offer of considerable quantities of high quality Darjeeling tea. Averages on 10th March were, Ceylon 22.46*d.*, Indian 22.30*d.*, and Java 17.80*d.* each per lb.

RUBBER.—Prices continued to decline during February but have shown a tendency to recover during March. This is probably due to the considerable amount of "bear" covering for near positions there being no indication of consumers entering the market. The position is obscure and American consumers show no signs of any serious buying. Only moderate supplies are coming on to the market, but unless there is a marked increase in consumption there is little likelihood of any sharp recovery in values. Spot Crepe sold at 2*s.* 6*d.* and Hard Fine Para at 2*s.* 5*d.* per lb. on 11th March.

COPRA.—The market has recently been more active and although latterly there is a tendency for buyers to become indifferent, holders are confident of sustained prices for all sorts.

GROUND-NUTS.—Up to the first week in March the market remained very quiet but subsequently substantial rises in prices were recorded, Indian reaching £21 10*s.* on 10th March, Nigerian £21 5*s.*, and Chinese £21 each per ton, on the same date.

PRIMITIVE FISHING.

THE rivers and creeks of West Africa are full of fish, but the methods of catching them, which vary with the districts, are still primitive. Great developments could be made by the introduction of European methods, and the people in the hinterland could be supplied with salted or dried fish, a food which is highly prized in these areas. The fish in West African waters are of all sizes, from minnows to the gigantic tarpon. Herring, mackerel, lobsters, and soles are abundant, and in the rivers may be found crocodiles and manatees. In the Lagos lagoon of late years a number of large tarpon have been caught. Before the war a small trawler was working off Lagos and a large quantity of excellent fish was obtained. Some of it was crudely cured and sold in towns distant from the rivers. In Sierra Leone, there is a small industry, but the methods of catching are still primitive. Spear and torchlight are used up to 100 large flat fish being caught in this manner in shallow waters in one canoe. The African fisherman is a good marksman and rarely misses. For deep-sea fishing the common line and hook made in England are used. Snuff hidden in fou-fou is a good bait, and an ink-coloured plant is the basis of another method peculiar to the Gold Coast, which stupefies the fish and drives them into a net. Fishing in company is an amusing adventure. Nets, baskets, calabashes and hands are used to catch fish and women and children come from all parts to take a share in the proceedings.—*Times Trade and Engineering Supplement.*

ADVERTISEMENTS.

MR. HENRY H. R. MOLE, of Little Neck, Long Island, New York, has been appointed advertising agent for *Tropical Agriculture* in the United States of America and Canada. All communications from those countries respecting advertisements should be addressed to him. The address of our advertising agent in the United Kingdom is 14, Trinity Square, London, E.C.3. Firms in the West Indies and British Guiana are requested to address their communications to the Editor, *Tropical Agriculture*, Imperial College of Tropical Agriculture, Trinidad.